97

RESTRICTED

UNCLASSIFIED

[redacted]

REFERENCE DATA

RETURN TO
HISTORICAL SECTION
HEADQUARTERS, USMC

Published:—
For Instructional Purposes Only.

MARINE CORPS SCHOOLS
MARINE BARRACKS, QUANTICO, VIRGINIA
1943

DECLASSIFIED
DOD DIR 5200.9

UNCLASSIFIED

MARINE CORPS HISTORICAL LIBRARY

FOREWORD

This edition of Reference Data is intended to be used in conjunction with and to supplement the following publications:

Staff Officers' Field Manual, (FM 101-10).
FM 21-30 (Conventional Signs, Military Symbols, and Abbreviations).
Tables of Organization, 1 July, 1942, Marine Division.
The Solution of Map Problems, MCS.
Combat Orders, MCS.

The factual accuracy of all matter contained herein has been adhered to as closely as consonant with the classification of the information involved. Just as it is assumed in a map problem that the map in use is an accurate picture of the terrain depicted, so it may be assumed for school purposes that the material herein is accurate. Those assumptions will give both instructors and students a common background and make for simplicity in instructional presentations.

While it is hoped that these tables will give a fair conception of the factors of time and space and the capabilities and limitations of material, it must be carefully noted that they will not necessarily be useful in the field. There all figures must be determined by experience under practical conditions and those figures will vary with such factors as the tactical situation, strength of units at any given time, terrain, weather, condition of roads, other logistical conditions, actual material available, morale, and the efficiency of troop leaders and the staff.

MARINE CORPS
HISTORICAL

MAR 25 1968

HIST REFERENCE SEC

13,303

TABLE OF CONTENTS

SECTION 1

TROOP MOVEMENT

Table Page
1 Basic Road Spaces 1
2 Average Time Length of Columns at Various Speeds 2-3
3 Road Space of Motor Columns at Various Speeds ... 5-7
4 Road Spaces—Marine Division 9
5 Rates and Lengths of Marches 10-11
6 Forced Marches by Foot Troops 12-15
7 Rate of Advance in the Attack 17
8 Troop Movement by Motor Truck 18
9 Loading of Motor Transportation 19
10 Miscellaneous Calculations 20-21
11 Troop Movements by Air Transportation 22-24
12 Boats 25

SECTION 2

SUPPLY AND EVACUATION

Glossary of Supply Terms 27-33
13 Time Elements in Regimental Supply Tasks 34
14 Evacuation Data 35-36
15 Weapons of Marine Infantry Regiment 37
16 Unit of Fire for the Weapons of the Marine Division and Additional Units 38-43
17 Ammunition Basic Weights and Measurements (Standard Package) 44-46
18 Units of Fire—Artillery 47
19 Ammunition Supply Requirements Per Day of Combat Expressed in Units of Fire 48
20 Artillery Ammunition Allotments 49
21 Ammunition Requirements—Smoke 50
22 Ammunition Requirements—Chemical Shell 51
23 Ammunition Requirements—Chemical Cloud Attack 52
24 Ammunition Requirements—Aircraft Chemical Munitions 53
25 Ammunition Requirements—Land Mines Chemical .. 54
26 Vehicles for Infantry Regiment 55
27 Motor Fuel and Lubricant Requirements 56

SECTION 3

CHARACTERISTICS OF MATERIAL

Table Page

28 Ration Weight and Measurement 59
29 Infantry Weapons 61
30 Grenade Characteristics 63
31 Characteristics of Artillery 65
32 Defense Battalion Weapons 67
33 Characteristics of Chemical Weapons 69
34 Characteristics of Armored Vehicles 70
35 Characteristics of Warships 71
36 Technical Characteristics of Aircraft 73-76
37 Aircraft Capabilities 77
38 Navy Bomb Characteristics 78
39 Effectiveness of Army Demolition Bombs .... Against Specified Objectives 79
40 Wire Communication 81
41 Radio Equipment 83

SECTION 4

MISCELLANEOUS

42 Guide for Use Persistent Vesicants 89
43 Standard Nomenclature List Authorized for Naval Vessels 90-93
44 List of Authorized Abbreviated Titles of Frequent Use 94-97
45 Phonetic Alphabet 98
46 Hours of Sunrise and Sunset 99
47 Miscellaneous Reference Data 100-101
48 Miscellaneous Units and Equivalents 102-103
49 Recent Military Symbols 104-118
50 Field Engineering Data 119
51 Foreign Maps 120-121
52 Use of Thrust Line 122-123

SECTION 1

TROOP MOVEMENT

TABLE 1

BASIC ROAD SPACES

	Yards
ANIMALS	
In column of fours, per animal	1
In column of twos, per animal	2
Single file, per animal	4
BICYCLE	4
CAR, Motor*	10
CART, hand-drawn (includes four men)	5
FOOT TROOPS	
In Column of fours, per man	1/2
In column of threes, per man	2/3
In column of twos, per man	1.2
GUN, 75mm, self-propelled*	13
MOTORCYCLE*	5
TANK, light or medium*	10
TRACTORS	
Light and medium*	5
Heavy*	10
Amphibian, on carrier*	30
TRAILER, tractor-drawn*	5
TRUCKS	
¼ Ton*	5
¼ Ton, with trailer or weapon*	8
½ to 3-Ton, inclusive*	10
½ to 3-Ton, inclusive, with trailer or weapon*	13
Over 3-Ton*	13
Over 3-Ton, with trailer or weapon*	27
VEHICLES, animal-drawn	
4 animals	20
6 animals	25
AVERAGE per vehicle for column consisting of various types of vehicles*	10

*These road spaces are for motor vehicles halted and closed up. For road spaces at various rates of march, see Table 3.

NOTES: 1. Computation of these tables is based on the marching formations prescribed in LFM, USN, 1938, to include changes Nos. 1 and 2.

2. Pack animals are considered to march single file, while spare animals go two abreast.

3. Road spaces of foot elements on the march are identical with those at a halt.

TABLE 2

AVERAGE TIME LENGTH OF COLUMNS AT VARIOUS SPEEDS

NOTES: (1) This graph gives the average time length of a column at various speeds, i.e., the time required for a column of a given length to pass any point when marching at the speed indicated.

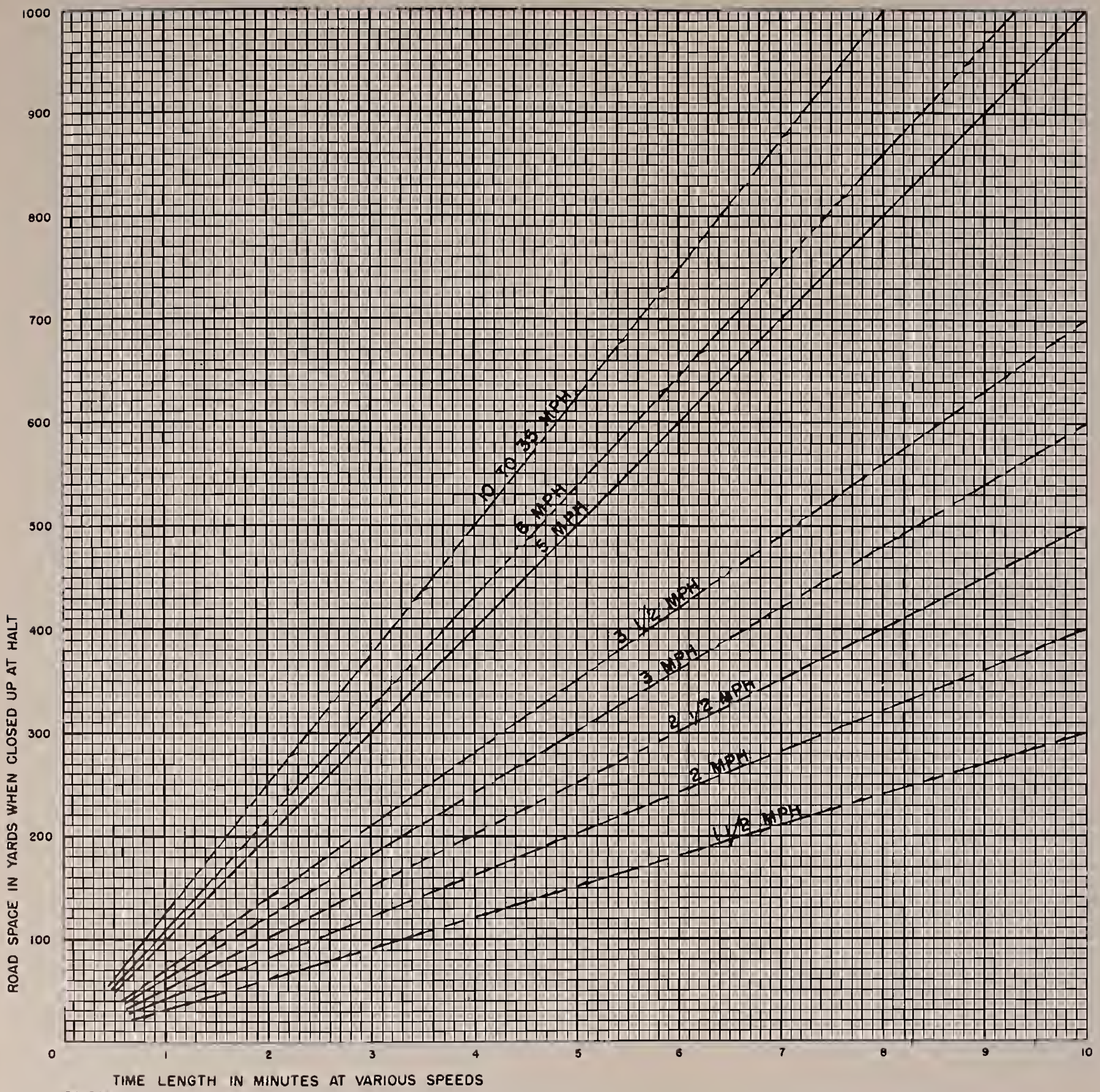
(2) Only an average time length is given herein; actual time length may vary 25% either way, depending upon conditions.

(3) Safe driving distance for road movements by motor columns is based upon the same factors considered in Table 3.

(4) When speed of motor column is 10 - 35 mph
$TL = N \times .08$
TL = Time length in minutes
N = Number of vehicles in the column
$8 = 100 \times .08$

ROAD SPACE IN YARDS WHEN CLOSED UP AT HALT
1000
900
800
700
600
500
400
300
200
100
0

TABLE 2
AVERAGE TIME LENGTH OF COLUMNS AT VARIOUS SPEEDS



RO. 2823-2

TABLE 3

ROAD SPACE OF MOTOR COLUMNS AT VARIOUS SPEEDS

NOTE: (1) These graphs apply to road movements by motor columns in which vehicles keep closed up to safe driving distance. Safe driving distance is assumed to be constant (14⅔ yards, center to center, for cars or trucks up to 3-ton) for speeds up to 5 miles per hour and to increase with the speed for rates above 5 miles per hour.

(2) These graphs give average road space. Actual road space may vary 25% either way, depending upon conditions.

(3) For road spaces halted, greater than 1,000 yards, multiply both the vertical and horizontal scales by either 10 or 100, leaving the speed graphs unchanged.

(4) $\text{RS (Miles)} = \frac{\text{TL} \times \text{MPH.}}{60}$

RS—Road Space.
TL—Time Length.
MPH—Miles Per Hour.

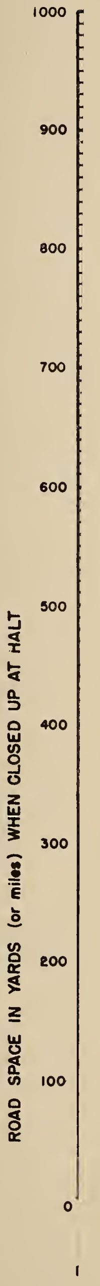
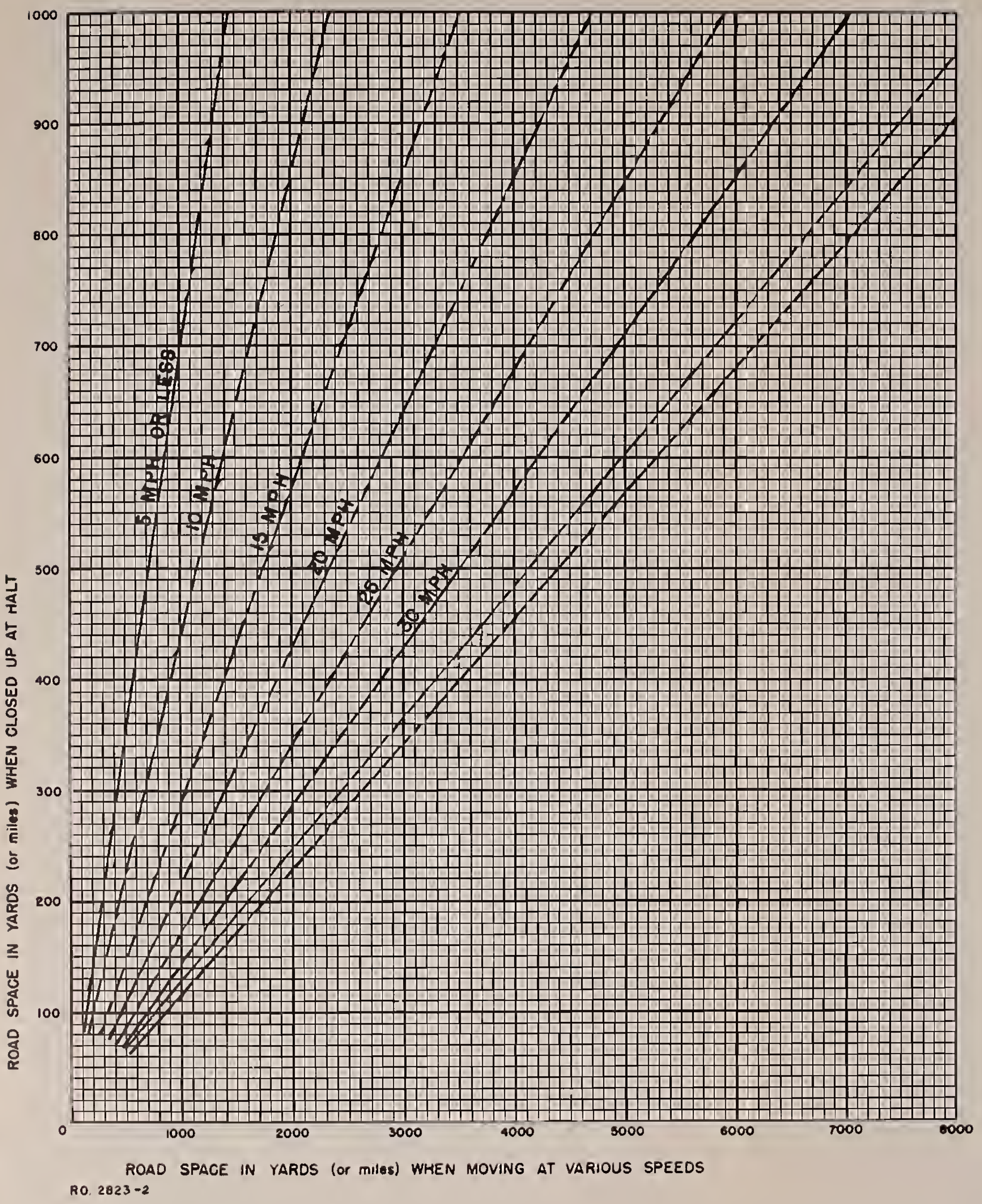

ROAD SPACE IN YARDS (or miles) WHEN CLOSED UP AT HALT
1000
900
800
700
600
500
400
300
200
100
0

TABLE 3
ROAD SPACE OF MOTOR COLUMNS AT VARIOUS SPEEDS



RO. 2823-2

TABLE 4

ROAD SPACES—MARINE DIVISION

Form for an Abridged Table of Road Spaces

	1	2	3	4	5	6	7	8	9	10	11	12
		T/O No.	Authorized strength		Actual strength			Road space at halt		Road space moving		
	Units		Men	Vehicles	Men	Vehicles	Men on foot	Men on foot (miles)	Vehicles (miles)	Men on foot (miles)	Vehicles 10 mph (miles)	Vehicles 25 mph (miles)
1	....Div											
2	....Marines											
3	....Marines											
4	....Marines											
5	....Bn ....th M											
6	....Bn ....th M, ...Bty ....th M, ...AA & AT Pl, ...Pl Co A ....Eng Bn											
7	....Bn ....M (less Bty ....)											
8	....Scout Co											
9	....Tank Bn											
10	....Sig Co											
11												
12												
13												
14												
15												

NOTES

Column 1: Designation of unit, as "1st Marine Division, "5th Marines."

Columns 5, 6, and 7: Based on periodic reports of subordinate units, the actual strength in men and vehicles should be entered.

Column 8: Number of men on foot x .8 (men in column of threes) = yds ÷ 1760 = miles.

Column 9: For a column of vehicles of all types, 10 yards per vehicle is used as the average road space.

Column 10: Road spaces of foot elements on the march are identical with road spaces at halt (dispersion for tactical reasons not considered).

Column 11: Number of vehicles x 23.5 yds. (2.35 x mph) per vehicle = yds ÷ 1760 = miles.

Column 12: Number of vehicles x 60 yards (2.35 x mph) per vehicle = yds ÷ 1760 = miles.

TABLE 5

RATES AND LENGTHS OF MARCHES

Unit	Average Rates (miles per hour)				Average Length On Roads (miles per day)
	On Roads		Across Country		
	Day	Night	Day	Night	
Infantry on foot	2½	2	1½	1	12 to 15
Tanks	25	25 (lights) 10 (no lights)	15	5	150
Artillery					
75mm gun (tractor)	3½	3	3	2	25 to 35
75mm how (tractor)	2½	2	1½	1	12 to 15
75mm (truck drawn)	25	25 (lights) 10 (no lights)	8	5 (lights) 3 (no lights)	150 to 175
Heavy (truck drawn)	15	15 (lights) 5 (no lights)	8	5	80 to 100
(tractor drawn)	3½	3½	3	2	25 to 35
AA (searchlights, truck drawn)	25	25 (lights) 10 (no lights)	8	5 (lights) 3 (no lights)	150 to 175
(guns, tractor drawn)	2½	2	1½	1	12 to 15
Cavalry	6	5	5	4	35
Trailers (tractor)	3½	3	3	2	25 to 35
Trucks and motor transport troop movements	25	25 (lights) 10 (no lights)			150 to 175
Cars, passenger and motorcycles	35	35 (lights) 10 (no lights)	8	5 (lights) 3 (no lights)	250
Cars, armored or scout	35	35 (lights) 10 (no lights)	10	5	200

In solving problems involving periods of march of less than one hour, infantry is assumed to move as follows:

	Yards per minute
On roads in daylight	88
On roads at night	70
Across country in daylight	53
Across country at night	35

NOTES:
1. These figures are furnished to secure uniformity in the solution of problems.
2. Rates given will generally be lowered by dust, heat, snow, sleet, mud, or other adverse conditions. Small elements of any of the above-mentioned units can move at a more rapid rate for short distances.
3. The rate of march of a column composed of elements with different rates of march is regulated by that of the slowest element.
4. The following rates in addition to those given in the table above are prescribed:

	Miles per hour
Individuals or small dismounted groups (such as a company commander and reconnaissance party)	3
Individuals or small mounted groups (such as a battalion commander and his reconnaissance party)	8

These rates will apply on or off roads by day or night. They apply especially to reconnaissance made by a commander and his party.

TABLE 6

FORCED MARCHES BY FOOT TROOPS

NOTES:

1. The ability of foot troops to make forced marches is a recognized fact. This table will be used as a guide to the capabilities of well seasoned foot troops, when well rested at the beginning of a march, with good weather and good roads. At the end of a forced march made in accordance with these figures, troops may be considered as capable of carrying on sustained combat. The decrease in combat efficiency of the troops due to the forced march is, however, a matter for careful consideration. The forced march ends for the unit considered when that unit has moved into the area necessary for the maneuver; for example, the assembly position.
2. This graph applies to large forces; small independent units might be expected to move more rapidly. It applies only to marches in which a single stage exceeds 15 miles or to a march of more than one stage in which long rest halts of less than 12 hours each are taken between stages. The graph shows only the minimum elapsed time required for any given distance. It does not show exact march rates. The time shown by the graph for a given distance includes a reasonable time for rest halts. The time given by the graph for a march of any particular distance is the minimum time required for that distance. The minimum time is subject to increase depending on the lengths of the rest halts actually taken. In no case should calculations be based on actual march rates greater than those given in Table 5.
3. For distances between 15 and 20 miles, the exact time depends upon the time consumed in marching the first 15 miles. For example, if the first 15 miles is marched during daylight, 17 miles may be marched in approximately 8 hours; if the first 15 miles is marched during hours of darkness, 9 hours will be required to cover 17 miles. When the first 15 miles is marched in part during daylight and in part during darkness, the time consumed for marches between 15 and 20 miles must be determined by interpolation. Forced marches, up to a total of 90 miles, are covered by the graph. If the distance contemplated exceeds 90 miles, all progress beyond 90 miles will be calculated on march stages of 15 miles or less with intervening rest halts of 12 hours each until a single halt of at least 24 hours is taken. Thereafter normal calculation of forced marches may be resumed.
4. An example of the use of the graph:

   Assume it is desired to start at daylight and accomplish a march of 33 miles. The graph shows that this distance will require a minimum elapsed time of 22½ hours. Such a march might be arranged as follows:

First stage, 18 miles. (The time required for this stage is taken from the graph as 9 hours, this time being adjusted for somewhat increased short rest periods and for possible diminution in march rates during the latter part of the march) . 9 hours

A long rest of .... 6 hours

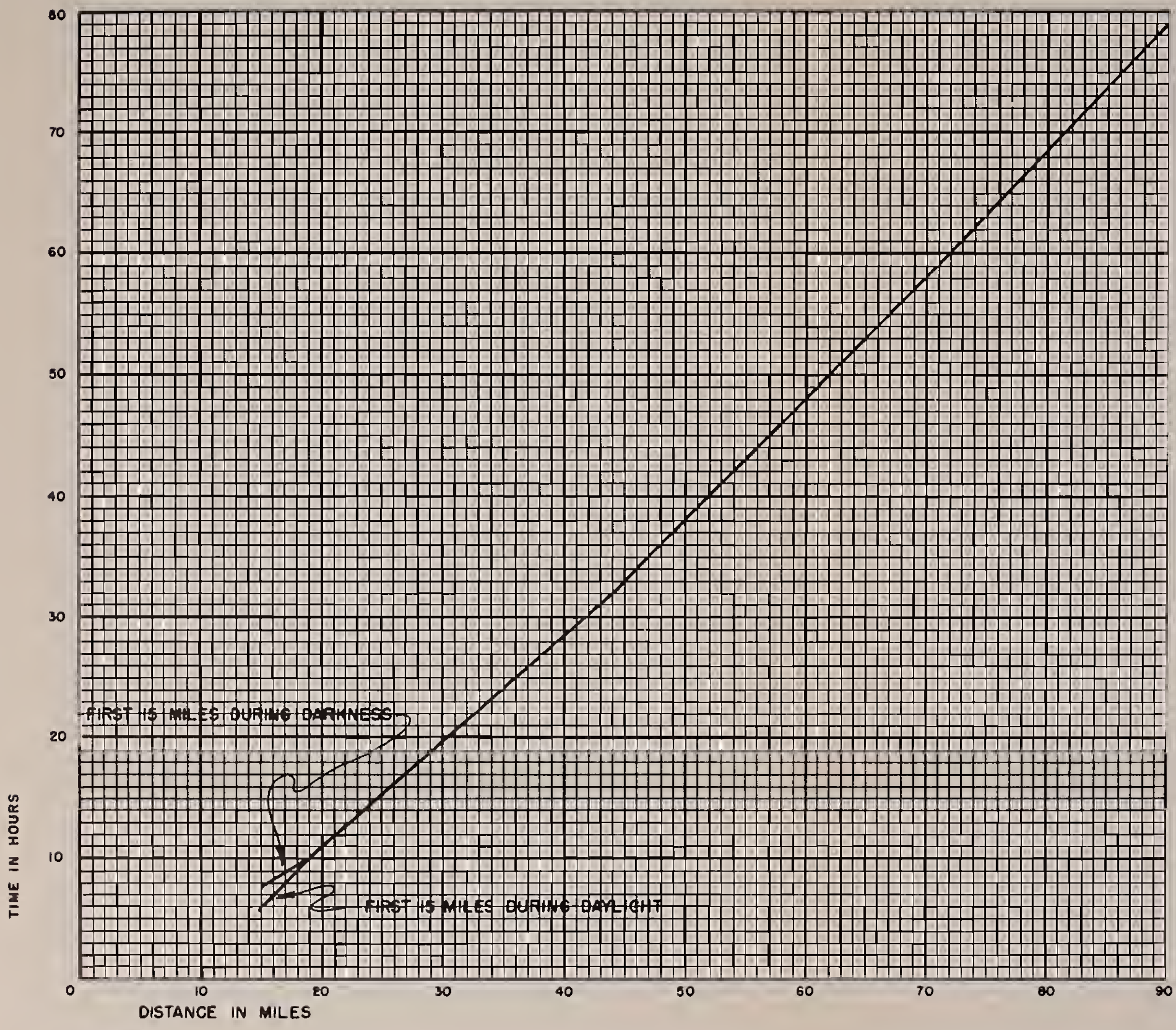
Second stage, 15 miles. (This is a normal stage and is calculated at normal march rates for the existing conditions of light or darkness. In this case it would be a night march) .... 7½ hours

Total time required .... 22½ hours

If, for example, a long rest halt of 8 hours had been taken, the time required for the march would have been 24½ hours. Six hours is the maximum rest halt that could be made without increasing the total time required above 22½ hours. If the first stage of the march had been a night march and the last stage a daylight march, a rest halt of approximately 7 hours could be taken without increasing the total time required. In both cases, rest halts shorter than the maximum could be taken but the rate of march thereafter would necessarily be decreased as the command could not arrive at its destination earlier than 22½ hours.

80
70
60
50
40
30
20
10
0
TIME IN HOURS

TABLE 6
FORCED MARCHES BY FOOT TROOPS



RO. 2823-2

TABLE 7

RATE OF ADVANCE IN THE ATTACK

In planning artillery and other support it is necessary to estimate the expected rate of infantry advance. This rate will vary between 100 yards in 3 minutes and 100 yards in 8 minutes depending upon the element of surprise, the amount of artillery and other support, the degree of enemy resistance, and the type of terrain.

TABLE 8

TROOP MOVEMENT BY MOTOR TRUCK

1. Truck capacities:	½ Ton	1½ Ton	2 Ton	2½ Ton
Troops seated with packs and individual equipment only;	5 men	15 men	20 men	25 men
For quick calculation use basis 10 men per rated ton truck capacity				
MG, How and Mort units with weapons and equipment;		10 men	13 men	

2. Road Space calculations:

Average road space per truck:

(1) 5 to 15 miles per hour	35 yards
(2) 16 to 25 miles per hour	50 yards
(3) Parked for entrucking or detrucking	10 yards

3. Time for loading and unloading:	To load	To unload
Personnel only	15 minutes	10 minutes
Materiel and personnel	30 minutes	15 minutes

TABLE 9

LOADING OF MOTOR TRANSPORTATION

1. The tonnage capacity of vehicles is figured as the stated capacity of the vehicle in addition to the following: the standard equipment of the vehicle, including tools and mounted weapons (if any), the weight of any fuel and lubricants in the built in fuel tank and crankcase of the vehicle, the vehicle driver and one additional man in the front seat.

2. The weight of the personnel traveling on vehicles is figured at 200 pounds per man with his individual equipment.

3. Carrying capacity of motor vehicles carrying no load of material other than individual equipment is figured as follows:

Passenger vehicles	as stated in their description, e.g., “5 passenger.”
Trucks ½-ton	5
Trucks 1½-ton	15
Trucks 2½-ton	25

The above figures should be reduced for trips of over 75 miles.

4. The time required for loading and unloading vehicles is as follows:

	To load	**To unload**
Personnel with individual equipment only	15 min	10 min
Material and personnel	30 min	15 min

5. The time required to prepare the vehicles of an infantry battalion or regiment to begin a coordinated movement is assumed to be one hour. This is in addition to the time required for distribution of the order (or warning order) giving notice of the approaching movement.

6. Drivers should inspect their vehicles at every halt. While this inspection should require 15 minutes, it may be ignored in figuring time for the start of a motor movement, since it will take place concurrently with the loading (or unloading) of the transportation.

TABLE 10

MISCELLANEOUS CALCULATIONS

Time Elements—Unloading Railway Trains

Unloading 1000-ton supply train (33 cars—11 men per car)	5 hrs
Loading 1½-ton trucks from railroad car	4 per hr
Loading 2½-ton trucks from railroad car	3 per hr

Labor—1 man can handle ⅔-ton per hr. for 12 hrs, each day

Capacities of Railway Trains

30 tons per car
33 cars per train
1000 tons of supplies per train
1200 men per train or 36 per car
450 patients (sitting or recumbent) with hospital train equal to 24 freight cars

Time Elements—Truck Movements

Trucks empty and standing in bivouac—15 minutes for condition of readiness to move

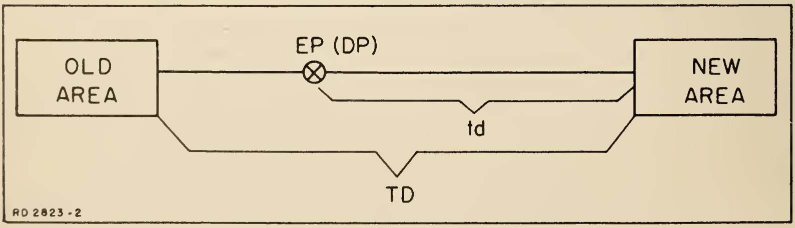
Trucks loaded—1 hour for unloading; condition of readiness simultaneous with this time factor

Shuttling—In movements involving shuttling, the following formula is useful:

$$T = TD + 2td + C$$

Let T = total time involved
TD = time distance old to new bivouac area
td = time distance old area to DP, or new area to EP
C = total time consumed in loading, unloading, turning around, clearing final serial into the new area. Although ordinarily ignored for planning purposes, the difference in time lengths between the first serial and the serial returning for shuttling purposes may be included.

The formula is illustrated as follows:



Should all troops be transported all the way, td has the same value as TD and the formula becomes:

$T = 3TD + C$

By using this formula the total time required to transport all troops all the way, or the minimum distance certain foot elements must march in order to complete the movement in a prescribed time may be determined.

TABLE 11

TROOP MOVEMENTS BY AIR TRANSPORTATION

The following data on weights of men and equipment are for use in air transportation of troops. They may be used for planning purposes, but do not obviate the necessity of weighing personnel and equipment prior to loading, if aircraft are to be loaded to full capacity.

Weights given for personal baggage are believed to be reasonable for average conditions. Limits should be set according to the special circumstances of each movement. Close supervision is required to keep personal baggage from exceeding the prescribed maximum.

1\.

Average weight 1 man (winter uniform)	155 lbs.
Pack, including 80 rounds ammunition	55
Rifle M-1	9
Helmet, steel	2.2
Gas mask	4.4
Total	234.6

The average weight of a man, fully equipped, but without overcoat, will be taken as 235 lbs. Officers and enlisted men armed with the pistol will be figured at the same rate, simplifying computations and providing a slight factor of safety. Men armed with the BAR will average 260 lbs.

2. Baggage.

Sea bag	55 lbs.
Officers bedding roll	30
Officers clothing roll	40

3. Office equipment.

Desk, field	120 lbs.
Typewriter w/chest	90

4. Organization Combat Equipment.

Gun, machine, M1917, cal. .30 (heavy) complete but without water or ammunition	119.1
Gun and tripod without water	84.5
Spare parts chest with contents	25.6
Water chest, empty	9.0
Ammunition chest filled (250 rounds)	20.5
If gun is filled with water add	7.25
If water chest is filled add	13.5
Gun, machine, M1919A4, cal. .30 (light) complete but without ammunition	66.0
Gun and tripod	45.36
Spare parts chest with contents	20.64
Ammunition chest filled (300 rounds)	20.8

Gun, machine, M2, cal. .50 (flexible) 36″ barrel complete but without ammunition	150.5
Gun and tripod	119.0
Spare parts chest with contents	31.5
Ammunition chest filled (100 rounds)	35.87

NOTE: 45″ barrel adds 10 lbs. to weight.

Gun, Thompson submachine, cal. .45, without magazine	10.75
20 rounds magazine filled	1.31
50 rounds magazine filled	4.95
Gun, 37mm, M3 (antitank)	912.0
Mortar, 60mm, M2	38.3
Mortar, 81mm, M1 complete	136.0
Rifle, BAR, model without magazine	15.5
Rifle, BAR, model modified without magazine	22.07
Loaded magazine, (20 rounds)	1.43
Rifle, M1903 without bayonet	8.69
Rifle, M1 without bayonet	9.62
Bayonet	1.0

5. Ammunition.

Grenades, hand, fragmentation (box of 25)	50
Cal. .30 average (box of 1,200)	100
Cal. .45 (box of 2,000)	104
Mortar, 60mm (carton of 6)	24.40
Mortar, 81mm (bundle of 6, light)	59
(bundle of 3, heavy)	57
(bundle of 3, smoke)	45
Gun, 37mm AT (box of 20)	100

NOTE: Approximately 14 lbs. per case of small arms ammunition can be saved by discarding the wooden shipping case and carrying the ammunition in the metal liner, only.

6. Communication Equipment.

Radio set TBX	254
Dynamotor for	47
Switchboard BD 71	58
Telephone set EE-8	11
Wire W-130, 1 mile	52

7. Medical Equipment and Supplies.

Medical Equipment * (100 men, 30 days)	133
Unit No. 10 (Treatment of Chemical Casualties)	68

*Medical equipment consists of:

Unit No. 1 Medical Officers kit	3
Unit No. 8 Pack, splint, combat	46
Unit No. 11A Case, sick call	80
Supplies	4
Sulfathiozole tablets (500)	2 bottles.

Tnc. Merthiolate (500 cc)	1 bottle.
Mapharsen (20 ampules)	2 boxes.
Diphtheria antitoxin (10000 units)	12 vials.
Tetanus Antitoxin (10000 units)	20 syringes.
Tetanus toxoid (15 cc vials)	2 vials.

NOTE: Antitoxins and toxoids must be kept in a cool place, preferably under refrigeration.

CAPACITY OF AIRCRAFT

The load capacity of transport aircraft varies widely with the type and with the distance to be flown. Normal pay load for the DC-3 (Navy R4D) is about 4,000 pounds under Department of Commerce rules and about 4,800 pounds under Bureau of Aeronautics rules. Seats are provided for 21 passengers. Cargo space of 148.5 cubic feet is accessible from the cabin. An additional 156 cubic feet of cargo space can be reached only from outside the plane. Cruising speed is 195 miles per hour or 170 knots.

TABLE 12

BOATS

Designating Letter	Type of Boat	Speed (MPH)	Available Boat Spaces
LCP (L)	36 ft. Personnel w/o ramp	10	36
LCP (R)	36 ft. Personnel w/ ramp	10	36
LCV - P	36 ft. Vehicle-Personnel	10	36
LCV	36 ft. Vehicle w/ ramp	10	36
LCS (S)	36 ft. Support craft	16	4
LCM (2)	45 ft. Tank Lighter	8.5	100
LCM (3)	50 ft. Tank Lighter	10	120
LCT (5)	105 ft. Tank Lighter	10	5 Med. Tanks
LCR (S)	12 ft. Rubber Landing Craft	6 W/motor	7 troops
LCR (L)	16 ft. Rubber Landing Craft	6 W/motor	10 men

NOTES: (1) A "boat space" is the space and weight allowed one marine with his individual combat equipment. It is found to be 224 pounds and 13.5 cubic feet.

(2) When computing boat spaces required for cargo, use either the weight or the space occupied, whichever is the greater.

(3) Hand carts, loaded or empty, require two boat spaces.

(4) Running time may be computed from the formula:

$$t = \frac{3d}{s} \text{ where}$$

$d =$ distance run in hundreds of yards.

$s =$ speed in knots (1⅛ MPH).

$t =$ running time in minutes.

SECTION 2

SUPPLY AND EVACUATION

1. **Scope.**—In addition to data applicable to the solution of supply and related problems offered by these Schools, a Glossary of supply terms is included in this section.

2. **Supply Mission.**—The mission of military supply is to make available to all units the supplies which they require, in adequate quantity, and by the time they are required.

GLOSSARY OF SUPPLY TERMS

Aid Station(s).—A field installation of a medical detachment where emergency treatment, sorting, classification, and evacuation of the sick and wounded is accomplished. Battalion aid stations are the medical installations closest the front lines in the evacuation service.

Ambulance Loading Posts.—Places where wounded are loaded into ambulances, such as collecting stations, sometimes aid stations and occasionally simply designated points along the ambulance route. Ambulances are loaded by collecting station or aid station personnel.

Ambulance Relay Posts.—Selected points along the route between collecting and hospital stations where one or several ambulances await their turn to go forward. They should have concealment, and if practicable, cover. They should not be located at crossroads or near ammunition distributing points, bridges, or fords.

Automatic Supplies.—Supplies consumed at a constant daily rate regardless of campaign conditions, as for example, rations. Automatic supplies are listed in Group 11 of the Equipment and Supply Tables.

Barrier Line.—A term used in control of traffic circulation. Generally a line beyond which free circulation is not permitted. Imposed restrictions, such as prohibition of running lights, circulation of some classes of vehicles, etc., are included in the order prescribing a barrier line.

Base (Rear) Area.—The rearmost locality within a single theatre of operations; one normally free from active ground hostilities. The major supply establishments of the Force are usually located in this area. The locality where the terminal of the lines of communication from the forward area is established.

Basic Unit (Hospital Station).—The nucleus of the hospital station. It comprises the admission, surgical, special treatment, and evacuation tents; and the kitchen and necessary sanitary installations; i.e., all of the station which is necessary for it to start functioning.

Circulation Map.—A map showing the circulation plan for a particular area including reserved routes, operating restrictions, etc.

Collecting Station(s).—A field installation of the medical organization serving a particular forward area. In short, a large Aid Station where casualties are collected from forward Aid Stations, accorded emergency treatment, sorted, classified, and moved to the rear by the vehicles of the collecting service. The forward terminal of ambulance service operating from hospital stations.

Daily Strength Report.—The only requisition required for automatic supplies. These reports are initiated at company headquarters in the forward echelon and are sent to the battalion command post. Each battalion forwards the collected data to the regiment and furnishes copies to Bn-4. The regimental forward echelon sends the collected reports to the personnel adjutant in the rear echelon. The latter makes up a consolidated regimental strength report including information as to the number of motor vehicles in the regiment and sends it to headquarters of the division, furnishing R-4 with a copy. This strength report is the basis for supplies issued two or more days later. The regimental supply officer makes daily contact with the division quartermaster in order to adjust differences.

Daily Telegram.—A telegram dispatched daily to higher authority by divisions or similar units giving the unit's situation as regards supplies. A strength report is included. The telegram is the basis on which automatic and other supplies to be forwarded on the daily train are computed.

Daily Train.—The train arriving daily at a railhead with supplies for troops which the railhead serves.

Day of Supply.—This is an arbitrary unit of measure for the various items of supply, except ammunition. It is based on the estimated average expenditure per day.

Distributing Point.—A place other than a depot or railhead where supplies are issued to regiments and smaller units. Distributing points are designated by the class of supplies therein; for example, "Ammunition Distributing Point, 5th Marines" or "Engineer Distributing Point, 1st Division."

Dump.—A temporary stockage of supplies established by a division or smaller unit. When supplies are ordered issued from dumps, the latter become distributing points. Dumps are designated by the identity of the unit establishing them and by the class of supplies therein; such as, "10th Marines Ammunition Dump" or "1st Division Automatic Supply Dump."

Entrucking (EP) and Detrucking Points (DP).—Designated points at which troops are to be entrucked or detrucked.

Entraining (EP) and Detraining Points (DP).—The particular places on a railroad, at which troops are entrained or detrained respectively. At certain entraining (detraining) stations there may be two or more entraining (detraining) Points.

Extra Ammunition.—The ammunition issued prior to entering combat to supplement the normal ammunition supplies carried by individuals or on organic carts. This extra ammunition is usually available from the ammunition train of the unit concerned. All, or part of the train loads may be issued as "extra ammunition" preliminary to active hostilities. Any ammunition not issued remains as a reserve.

Hospital Station(s).—A field installation of the division (or higher) medical service where casualties are assembled from forward collecting stations and accorded temporary hospitalization and treatment preliminary to removal to a hospital ship, or Base hospital. (See Base Unit.)

Initial Point (IP).—A place on the route of march where the various subdivisions of a command successively enter into a march column.

Lines of Communication.—The routes between the Base Area and the Forward Area which must be utilized for circulation between the major military establishments located in these two areas respectively. May include railway, motor road, water-way, or air routes, or a combination of two or more such routes. In short, the traffic routes connecting the major organizations of the Forward area with Base installations.

Main Supply Road.—The best forward-bound road for loaded vehicular traffic. It receives first priority of maintenance.

March Collection.—The collection of march casualties by the ambulances of the medical organization(s) operating along the route of march.

March Collecting Posts (Points).—Posts established by medical organization personnel along a route of march where march casualties are collected from passing organizations and assembled preliminary to evacuation by ambulance.

March Column.—It consists of one or more march units grouped under a single commander.

March Serial.—A march serial consists of a part of a command placed under the orders of a subordinate commander for movement. Frequently a march serial is formed by combining the elements of a command that are to travel at the same rate of march.

March Stage.—Distance between two places of rest during a march.

March Unit.—The group of troop and service elements assembled under a single commander for the purpose of control during a march.

Mess Location.—The point usually selected by a company commander whose troops are to be fed by the vehicle concerned; the place where kitchen vehicles carrying cooked rations are finally conducted. In short, the terminal of a company kitchen vehicle carrying cooked rations for issue to that company. It may not be the location where the troops are fed inasmuch as the situation might require an additional carry from the point reached by the vehicle.

Natural Lines of Drift.—Covered or protected routes, usually along ravines or stream beds, between the aid stations of smaller units and the collecting station. These routes are selected by the contact agents, used by the litter squads, and instinctively followed by the walking wounded.

Navigationhead.—Same installation as a railhead except that it is located on a waterway instead of on a railroad.

Normal Supply.—The status of supply of a unit is "normal" when, at any specific time, all prescribed supplies are on hand and no excess is carried.

Other Administrative Details Later.—A phrase, the purpose of which is to avoid encumbering the written order with details. It means that essential information of an administrative nature, not included in the order, will be furnished later to the units affected in the form of messages, either written or oral.

Point of Release.—A point most convenient to any unit at which kitchen trucks carrying cooked rations are released from higher to lower control. The trucks are then conducted as close to the units as the situation permit. Usually established by both regiment and battalion.

Priorities.—Definite rulings which establish the precedence of shipments and of movement by rail, road, and water routes.

Railhead (Truckhead) (Navigationhead).—A supply point where loads are transferred from the designated type of transportation. For example, "Automatic Supply Railhead, 1st Division"; "Gasoline and Oil Railhead"; "Ammunition Railhead, 1st Division."

Railhead Distribution (Also Truckhead or Navigationhead).—A form of distribution of Supplies by a division, or similar higher supply echelon, where the train elements of regiments and other designated organizations must accomplish the necessary hauling from the railhead, or similar installation. In short, the distribution of Supplies to subordinate units at a railhead.

Railhead Reserves.—The local reserves of Supplies built up by Division, or similar highest supply echelon, at a railhead. These local reserves are necessary in order to provide for lapses in daily deliveries from Base installations incident to enemy activities or other cause. Usual quantity so kept in railhead reserve limited to one or two days supply for all organizations served.

Ration.—A ration is the allowance of food for the subsistence of one person or animal for one day.

Emergency:

(1) (Army type D).—Consists of three 4-ounce bars of concentrated chocolate.

(2) Landing: (Army type C).—Consists of previously prepared food, packed in hermetically sealed cans, and may be eaten either hot or cold. It is made up of the following:

- 3 cans containing a meat and vegetable component.
- 3 cans containing crackers, sugar, and soluble coffee.

(3) Special: (Army type K).—Consists of previously prepared food packed in boxes as follows:

Breakfast Unit.
Dinner Unit.
Supper Unit.

Ration Cycle.—The order of distribution of the meals making up a single day's ration. For example, a ration cycle commencing with the supper meal would include breakfast and lunch the following day.

Rear Area.—See Base Area.

Regulating Point. (Motor Transport.)—A place where a truck column, entering an area to entruck or detruck troops, is broken up. It is from this point that motor transport groups of the incoming truck column are dispatched to the various entrucking or detrucking points.

Requisition.—A request for supplies. It may emanate from any element of a command at any time. Within the regiment it may be in any form, such as a telephone request, a written or oral message brought by a messenger or an empty ammunition truck. Each legitimate request must be honored throughout the chain of command whenever possible.

Road Capacity.—Road capacity is dependent on method of construction, materials used, drainage and minimum width.

Road Net.—The system of roads available within a particular locality or area.

Roads, Classification of.—Roads are classified as one-, two-, or three-track depending on the lines of traffic it can carry (9 feet per line), and as one- and two-way depending on direction of traffic. Only two columns usually move on a three-track road, leaving one track for passing.

Road Space.—The road space of a unit is its length from head to tail in prescribed march formation.

Rolling Reserves.—The prescribed normal loads carried by the trains of the division in addition to the supplies accumulated in depots or the division supply establishments. These rolling reserves are maintained intact insofar as is practicable and are dumped only when the transportation is required for other purposes.

Route of Advance of Ammunition.—A designated route along which the regiment (battalion) ammunition distributing point is advanced by bounds as the attack advances, to assure a supply of ammunition being as convenient to the assault echelons as the terrain and tactical situation will permit.

Serial.—See **March Serial.**

Shuttling.—The employment of motor vehicles, in conjunction with marching, for the movement of troops, equipment, and supplies from an initial point to a destination. The motor transport elements may make complete trips, partial trips to intermediate points, or both. The foot elements alternate between riding and walking for designated stretches.

Sorting of Casualties.—The determining of the disposition to be made of the wounded. It is a function of all medical installations in the field commencing at the front. Some of the slightly wounded are returned to duty after treatment. These cases, together with any stragglers and malingerers are turned over to the military police for return to their organizations. Wounded who can not be retained at any medical installation because of the military situation or lack of facilities for successful treatment are sent to the rear by ambulance or other conveyance.

Supply Depot.—A major establishment of the higher supply services. It includes facilities for the receipt, storage, and distribution of all classes of supplies. It implies complete facilities and all classes of materiel as compared to the limited facilities and stockage implied by the designations Supply Station or Supply Point.

Time Distance.—The time required to move from one point to another point at a given speed.

Time Length.—The time in minutes required for an entire column, moving at a given speed, to pass a given point.

Train Bivouac.—A location where trains are temporarily parked and from which they operate.

Trains.—Trains include that portion of the transportation of a unit which operates under the immediate orders of the unit commander for purposes of supply, evacuation, and maintenance. Trains are designated in two ways, as follows:

(1) By units: as, "5th Marines Train" or "Train 1st Battalion 5th Marines," Such designation refers to all trains of the unit concerned.

(2) By unit and function: as, "Ammunition train 5th Marines"; or "Kitchen and baggage train 1st Battalion 5th Marines."

Unit Distribution.—A form of distribution of Automatic Supplies by a division, or similar higher supply echelon, where the train vehicles of the higher supply echelon are employed to make deliveries to specified units. Normally, this distribution is by division train elements to those of the regiments at the regimental train bivouacs

Unit Fuel (Lubricant) Requirement.—Number of gallons fuel (lubricant) required for 30 days. See "TBA" for computed requirements.

Unit Mile.—Number of gallons of gasoline required to move every vehicle of a unit one mile.

Unit of Fire.—An arbitrary medium of calculation, expressed in rounds per piece, used for the calculation of ammunition requirements within larger organizations.

Unit Transport.—All of the motor transport elements (vehicles) organically provided, or attached to, a unit, which are not functioning as train units (vehicle) in the services of supply, evacuation, and maintenance.

Walking Wounded.—Men who are slightly wounded and able to walk back to the collecting station. They may be used by the contact agent in carrying messages to the collecting station.

TABLE 13

TIME ELEMENTS IN REGIMENTAL SUPPLY TASKS

PERIODS REQUIRED TO PERFORM SUPPLY TASKS UNDER CONDITIONS IMPOSED BY ACTIVE OPERATIONS IN THE FIELD

Work	Daylight	Dark
Distribution (unloading) of automatic supplies to regiment by higher echelon at one distributing point.	½ hr.	½ hr.
Distribution (unloading) of automatic supplies to separate battalion by higher echelon or similar unit.	¼ hr.	¼ hr.
Sorting of one day's automatic supplies into company lots at train bivouac.	1 hr.	1½ hrs.
Physical distribution from supply vehicle or dump to kitchen truck of one ration.	15 min.	20 min.
Kitchen units (Ranges & equipment) to be taken off trucks, set up, and ready to begin cooking.	15 min.	20 min.
Division of one ration into three meals at kitchens (included in item next above).	15 min.	20 min.
Kitchens to cook and prepare for serving hot meal, starting with hot kitchen.	2 hrs.	2½ hrs.
Kitchens to prepare cold noon meal, issue to take place usually coincedent with serving breakfast. (Included in item next above).	1 hr.	1½ hrs.
Serving hot meals to troops from kitchen truck when majority of men are served at trucks.	45 min.	1 hr.
Serving hot meal to troops by means of carrying parties (assuming kitchen not farther than 1000 yards in rear of company).	1½ hrs.	2 hrs.
Issue of extra ammunition to battalion in assembly area.	30 min.	40 min.

OTHER TIME ELEMENTS

To load infantry ammunition vehicles at a division ammunition distributing point	¼ hr.
To load infantry weapons and ammunition carriers at a regimental ammunition distributing point	¼ hr.
To unload infantry ammunition vehicles at positions	¼ hr.
Distribution to trucks of gasoline and oil in containers	¼ hr.

TABLE 14

EVACUATION DATA

(Adapted from U.S. Army calculations and applicable to the Marine Division, T/O 28 August 1941)

1. **Casualty Estimates—General.—a. Classification.**—All casualties are classified as follows:

Sick	Communicable	Slight	Walking	
				Recumbent
	Noncommunicable	Medium	Transportable	
Gassed				Sitting
Wounded		Severe	Nontransportable	
Dead				

2. **Sick.**—a. Casualties from sickness and nonbattle injuries from front line troops of a seasoned command in campaign, except in a particularly unhealthful region, cause an average daily increment of sick of about six-tenths of one percent (0.6%). Of these, two-thirds will remain under treatment in their own organizations (at aid station or dispensary) or in the division clearing station; one-third will be evacuated outside the division area, half of them recumbent and half of them sitting.

b. The daily admission rate to the hospital for an entire field force for sick and nonbattle injuries will be approximately .165 percent. After some months, this will cause a constant noneffective rate of about 4.5 percent.

c. Of the sick admitted to the hospitals in the theater of operations about 1.5 percent die, 3 percent will be invalided home, and 95.5 percent will be returned to duty eventually. The average stay in the hospital is 27 days.

3. **Battle Casualties.**—a. The following table has been developed from American Experience in active operations of the World War:

Battle Casualties, Including Killed, In Percent Of The Unit Strength

Unit	Average for all days in line	Severe Battle day	Maximum Battle day
Marine Regiment	2.5 percent	12-15 percent	35 percent
Marine Division	1.0 "	6-8 "	12 "

b. The following data relative to battle casualties are approximately accurate for a severe engagement and can be used as the basis for calculations:

In temperate and tropical zones, the ratio of killed to wounded is as follows:

Open operations	about 1 : 5
Trench operations	about 1 : 4

Hence from 16⅔ percent to 20 percent of all battle casualties may be expected to be classed as killed. In Artic zone, the ratio of killed to wounded will be considerably higher due to death of the wounded from exposure to cold.

4. The transportation requirements for battle casualties of a Marine Division are as follows:

	Percent
Dead	20
Able to walk to the collection station but requiring transportation (sitting) to the Hospital station	40
Require transportation (litter cases)	40
Of all casualties, about 1 percent are non-transportable beyond the hospital station	
Total	100

5. Time Element of Evacuation.—

a. **Personnel:**

For round trip evacuation (including loading and unloading):

Litter squads: 1,000 yds in one hour.

Wheeled litters: 1,250 yds in one hour.

Ambulance, animal drawn: 2 miles in one hour.

Ambulance, motor, during combat in division area: 5 miles in one hour.

b. **Elements:**

Aid Station set-up	15 min
Collecting Station established under canvas	20 min
Hospital Station set-up under canvas ready to function	1 hr
Wounded reach Collecting Station after combat initiated	1 hr
Wounded reach Hospital Station after combat initiated	2 hrs

6. **Ambulance Load.**—The average ambulance load is calculated as 6 patients, (4 sitting and 2 recumbent).

TABLE 15

WEAPONS OF MARINE INFANTRY REGIMENT

Weapon	H&S Co.	Weap. Co.	(3) Inf. Bns.	Total Regt.
Carbine, Cal. .30 M1	98	163	1152	1413
Gun, Mach. Cal. .30 M1917A1			36	36
Gun, Mach, Cal. .30 M1919A4		18	63	81
Gun, Mach. Cal. .50 AC		8	6	14
Gun, 20mm		12		12
Gun, 75mm		2		2
Launcher, A-T		14	33	47
Launcher, Gren. M1		4	93	97
Mortar, 60mm			27	27
Mortar, 80mm			12	12
Rifle, Cal. .30 M1	57	33	1545	1635
Rifle, Auto. Cal. .30 M1918A2			189	189
Pistol, Very MK III	1	1	6	8
Projector, Signal Ground M4	3		6	9
Carbines, Cal. .30 M1. Reserve for Med. Personnel	17		66	83

TABLE 16

A Unit of Fire, expressed in rounds of ammunition, indicates the average expenditure in one day of combat.

UNIT OF FIRE FOR THE WEAPONS OF THE MARINE DIVISION AND ADDITIONAL UNITS

Cal. .30 Am

Unit of Fire is per weapon unless otherwise expressed.

Carbine		60	B
Rifle, M1903			
	Inf/Bn	80	B
		15	AP
		5	T
	Rdr/Bn	80	B
		15	AP
		10	T
	Other	35	B
		5	AP
Rifle, M1			
	Inf/Bn	128	B
		24	AP
		8	T
	Rdr/Bn	128	B
		24	AP
		16	T
	Other	32	B
		8	AP
Rifle, Auto. M1918A2			
	Rdr/Bn	335	B
		65	AP
		40	T
	Other	335	B
		65	AP
		20	T
Gun, Machine, M1917A1			
	Ground	4800	B
		850	AP
		850	T
	Df/Bn; CDf/Bn; AD/Bn	6000	B
		750	AP
		750	T

Gun, Machine, M1919A4		
Ground	700	B
	100	AP
	100	T
Rdr/Bn	700	B
	100	AP
	200	T
Tank	2250	AP
	750	T
	3000	Links
Amphn Tractor; Rubber Boat	300	B
	100	AP
	100	T
Armored Amphn; Support Boat	600	B
	200	AP
	200	T
Sct/Car; Other	3000	AP
	1000	T
Gun, Machine, Light, Johnson		
Prcht/Regt; Rdr/Regt	700	B
	100	AP
	100	T
Gun, Machine, Lewis		
Landing Boat	300	B
	100	AP
	100	T
Cal. .45 Am		
Pistol	20	B
Gun, Submachine	200	B
Gun, Submachine, Substituted for Carbine	80	B
Cal. .50 Am		
Gun, Machine, M2 HB		
Flexible		
Sct/Car; 6-9 Tank	1200	AP
	300	T
	1500	Links
Amphn Tractor; Tank Lighter	375	AP
	125	T
	500	Links

Medium Tank	2250	AP
	750	T
	3000	Links
Support Boat	750	AP
	250	T
	1000	Links
Other	1800	AP
	700	T
	2500	Links
Gun, Machine, M2, Water Cooled		
All	3000	AP
	1500	T
	4500	Links
12 Gauge, Shotgun (#00 Buckshot)	40	

OTHER THAN SMALL ARMS

Gun, 20mm		
Wpns Co Inf/Bn	125	HE Mk3
	125	HET Mk4
Wpns Co Inf/Regt	250	HE Mk3
	250	HET Mk4
Df/Bn	1500	HE Mk3
	1500	HET Mk4
On 40mm Mount	1200	HE Mk3
	1200	HET Mk4
Gun, 37mm		
Tank	40	Can
	60	HE M63
	140	AP Shot M74
Antitank	40	Can
	60	HE M63
	140	AP Shot M74
Antiaircraft	200	M54 AA
	100	AP Shot M74 AA
Armored Amphn	25	Can
	60	HE M63
	15	AP Shot M74
Gun, 40mm Antiaircraft	380	HE Mk II
	120	AP Shot M81

Mortar, 60mm	60	HE
	10	Illum
Gun, 75mm		
Towed	24	HE, M48, w/f PD, M48 (SC)
	72	HE, M48, w/f T-Sq, M54 (SC)
	48	HE, M48, w/f PD, M48 (NC)
	48	HE, M48, w/f T-Sq, M54 (NC)
	60	HE, M48, w/f PD, M48 (RC)
	24	HE, M48, w/f T-Sq, M54 (RC)
	12	AP Shot, M61
	12	Smoke, WP, Mk2
Motor Carriage	96	HE, M48, w/f PD, M48 (SC)
	96	HE, M48, w/f T-Sq, M54 (SC)
	96	AP Shot, M61
	12	Smoke, WP, Mk2
Medium Tank	50	HE, M48, w/f PD, M48 (NC)
	50	AP Shot, M61
Howitzer, Pack, 75mm	125	HE, M48, w/f PD, M48
	135	HE, M48, w/f T-Sq, M54
	10	HE, AT, M66
	15	Smoke, WP, M64
	15	Gas, Persistent, RS, M64
Mortar, 81mm	48	HE, M43A1
	48	HE, M56
	9	Smoke, WP, M57
Gun, 90mm Antiaircraft	240	HE, M71, w/f Mt. M43A1
	20	AP Shot, M77
	40	HE, M71, w/f PD, M48
Howitzer, 105mm	85	HE, M1, w/f QD, M48
	90	HE, M1, w/f T-Sq, M54
	5	HE, AT, M67
	10	Smoke, WP, M60
	10	Gas, Persistent, HS, M110
Howitzer, 155mm, M1	40	HE, M107, w/f PD, M51A1
	40	HE, M107, w/f T-Sq, M55A1
	10	Gas, Persistent, HS, M110
	10	Smoke, WP, 116
Howitzer, 155mm, M1918	40	HE, M102, w/f PD, M51AL
	40	HE, M102, w/f T-Sq, M55A1
	10	Smoke, WP, M105
	10	Gas, Persistent, HS, M105
Gun, 155mm	65	HE, M101
	35	AP, M112
Gun, 3″ Antiaircraft, M3	260	HE, M42, w/f M43A2
	32	Navy Common
	8	AP Shot, M62

Gun, 3″/50, Antiaircraft	275	HE
	25	Navy Common
Gun, 5″/51	5	HE
	40	Common
	5	Illum
Gun, 6″/50	40	AP
	5	Illum
Gun, 7″/45	20	Semi-AP
	20	Field
Pyrotechnics		
Lights, Signal, Very	15	Asstd
Flare, RR, Red		
Hq Co Prcht/Bn	12	
Signals, Ground Asstd.	1500	Per Division
	450	Per Sep/Inf/Regt (Rein)
	180	Per Df/Bn; AD/Bn
	150	Per Sep/Inf/Bn(Rein)
Torpedo, Bangalore, M1	100	Per Co in Eng/Regt
	100	Per Co in Ave/Bn
	10	Per Co in Rdr/Bn
Demolition Charge (55lb)	20	Per Hq Co in Eng/Bn
	20	Per H&S Co in Eng/Regt
	20	Per H&S Co in Ave/Bn
	10	Per H&S Btry in Df/Bn
	10	Per H&S Btry in CDf/Bn
	10	Per H&S Btry in AD/Bn
Rocket, Antitank, M6	5	Per Launcher, AT M1
Grenades		
Antitank, M9A1		
Inf; Eng; Prcht; Rdr	1	Per 5 Enlisted
FA; Spl Trps; Df	1	Per 10 Enlisted
Hand, Fragmentation, Mk II	180	Per Rifle Co
Inf; Eng; Prcht; Rdr	1	Per Enlisted
FA; Spl Trps; Df	1	Per 2 Enlisted
Adapter, Grenade Proj. M1	50%	of Hand Grenades
Hand, Gas Irritant, CN-DM,N6		
Sct/Car	2	

Hand, Offensive, Mk 3	100	Per H&S Co, Inf/Regt
	2	Per Sct/Car
	2	Per Motorcycle and ¼-ton (Except in D-SV/T)
Hand, Smoke, HC, M8	4	Per Tank; Sct/Car
	2	Per Motorcycle and ¼ ton Truck (Except in D-SV/T)
Hand, Incendiary, Thermite, M14	10	Per Wpns Co Inf/Regt
	10	Per Hq Co Inf/Bn
	10	Per H&S Btry A/Regt
	10	Per H&S Co Tk/Bn
	10	Per SctCo LTk/Bn
	10	Per H&S Co Prcht/Bn
	10	Per H&S Btry Df/Bn
	10	Per H&S Btry CDf/Bn
	10	Per H&S Btry AD/Bn
	10	Per H&S Btry AT/Bn
Additional Allowance	2	Per Tank; Sct/Car
	2	Per Motorcycle; ¼-ton Truck (Except in D-SV/T)
Hand, Incendiary, Frangible, M1 Asstd.	30	Per Hq Co Inf/Bn
	30	Per Wpns Co Inf/Regt
	30	Per H&S Btry A/Regt
	30	Per Sct Co LTk/Bn
	10	Per H&S Co Tk/Bn (L&M)
	30	Per Hq Prcht/Bn
	30	Per H&S Btry AD/Bn
	30	Per H&S Btry Df/Bn
	30	Per H&S Btry CDf/Bn
	30	Per H&S Btry AT/Bn
Mine, Antitank, HE, M1	100	Per Eng Co in Eng/Bn
	100	Per Hq Co Prcht/Bn
	100	Per H&S Co Eng/Regt
	150	Per H&S Btry Df/Bn
	150	Per H&S Btry CDf/Bn
	150	Per H&S Btry AD/Bn
	100	Per H&S Btry AT/Bn
	100	Per H&S Btry Ave/Bn
Mine, Antipersonnel, M2	150	Per Eng Co Eng/Regt
	500	Per H&S Btry Df/Bn
	500	Per H&S Btry CDf/Bn
	500	Per H&S Btry AD/Bn

TABLE 17

AMMUNITION BASIC WEIGHTS AND MEASUREMENTS (STANDARD PACKAGE)

Type	Rounds	Wt. lbs.	Cu. Ft.
Cal. .30			
Ball			
Carbine	2000	63	.5
M1 (Clips)	1152	99	1.5
BAR (Mag)	1200	100	1.5
M1903 Rifle	1200	99	1.5
MG (Belted)	1250	101	1.5
AP	1500	105	1.5
Tracer	1500	109	1.5
Cal. .45, Ball	2000	110	.93
Cal. .50			
AP	300	104	1.5
Tracer	300	100	1.5
Belted	300	106	1.5
Links, Metal			
Cal. .30	5000	71	1.6
Cal. .50	1000	51	1.3
20mm			
37mm			
Canister	20	102	2.3
HE, M63	20	91	
AP Shot M74	20	101	
HE, M54 AA	20	85	2.1
AP Shot M74 AA	20	101	
40mm AA			
HE, Mk2	24	153	
AP Shot, M81	24	153	
60mm Mortar			
HE	18	81.3	2.5
Illuminating			
75mm Howitzer			
HE, M48	3	65.3	.9
AP Shot, M61	3	65.3	.9
Smoke, Wp	3	65.3	.9
75mm Gun			
HE, M48	3	64.6	1.0
AP Shot	3	65	1.0
Smoke, WP, Mk2	3	60.5	1.0

81mm (Mortar)			
HE, M43	6	59	1.08
HE, M56	3	42	.91
Smoke, WP, M57	3	45	.91
90mm, Antiaircraft			
HE, M71	4	224	
AP Shot			
105mm, Howitzer			
HE, M1	2	128	1.95
HE, AT			
Smoke, WP, M60			
Gas, Persistent, HS			
155mm, Howitzer, M1			
HE, M107			
Smoke, WP, 116			
Gas, Persistent, HS			
155mm, Howitzer, M1918			
HE, M102			
Smoke, WP, M105			
Gas, Persistent, HS			
155mm, Gun			
HE, M101	1	95	.79
AP, M112			
3″, Antiaircraft M3			
HE, M42	4	151	3.11
Navy Common	4	151	3.11
AP Shot, M62			
3″/50, Antiaircraft			
HE			
Navy Common			
5″/51,			
HE			
Common	1	50	.26
Illuminating	1	55	.32
6″/50,			
Charge	1	104	1.6
AP-Projectile	1	105	.5
Illuminating-Proj.	1	96.5	.5
7″/45			
Charge	1	106	1.5
AP-Projectile	1	165	.84
Field			
12 Gauge, Shotgun	500	65	.9

Light, Signal, Very	252	31	.92
Demolition Charge(55)			
Rocket, Antitank, M6	20	112	
Grenades			
Antitank, M9A1	10	31	.99
Hand, Frag. Mk II	25	50	1.03
Hand, Gas Irr. M6	25	49	1.31
Hand, Offensive, Mk3			
Hand, Smoke, HC, M8	25	66	1.31
Hand, Incend. Therm.			
Hand, Incend. Frang.			
Mine, AT, HE, M1	5	50	2.5
Mine, APersnl.			
Signals, Ground			
White Star Prcht	30	34	1.05
White Star Cluster	50	55	2.22
Red Star Cluster	30	34	1.05
Red Chain Prcht	50	55	2.22
Green Star Prcht	50	65	2.22
Green Star Cluster	50	55	2.22
Amber Star Prcht	50	64	2.22
Amber Star Cluster	50	55	2.22

TABLE 18

UNITS OF FIRE—ARTILLERY

	Rounds per piece	Approximate weight of round packed	Total weight in pounds	Rounds per bundle or box	Boat spaces
75mm Pack How	300	25 lbs.	7500	3	34
105mm How	200	61 lbs.	12200	3	61
155mm How	150	114 lbs.	17100	s.l.*	77
155mm Gun	100	148 lbs.	14800	s.l.*	66
3" Gun AA	300	39 lbs.	11700	4	53
.50 cal. MG, HB	1500	0.36 lbs.	540	280	3
40mm AA gun	400	61 lbs.	2400	16	11
20mm AA gun	3750	0.6 lbs.	2250	180	12
90mm AA gun	300	56 lbs.	16800	4	76

***NOTE:** s.l. indicates "separate loading".

TABLE 19

AMMUNITION SUPPLY REQUIREMENTS PER DAY OF COMBAT EXPRESSED IN UNITS OF FIRE

Type of Combat	Artillery				Small arms	90mm gun	4.2 inch Cml Mortar
	75mm How	105mm How	155mm How	155mm Gun & larger			
Covering and Security Force Action	1.5	1.5	0.5	—	1.0	1.0	1.0
Meeting engagement	1.5	1.5	1.5	1.0	1.0	1.0	1.5
Attack on Defense of a Position first day	2.0	2.0	2.0	1.5	1.5	1.0	2.0
Succeeding days	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Pursuit, retirement or delaying action	1.0	1.0	1.0	0.5	0.5	1.0	1.0
Inactive situation	0.2	0.2	0.2	0.2	0.2	1.0	0.2

NOTES: 1. "Inactive situations" refers to forces in contact but neither side attacking.

2. Actual ammunition requirements in the several types will vary with each particular situation. Data are based upon such situations and studies as are available and serve merely as a guide.

3. Expenditures for preparations and counterpreparations are not included in the above table. Additional ammunition must be provided for these scheduled fires.

TABLE 20

ARTILLERY AMMUNITION ALLOTMENTS

Kind of Fire or Phase of Action	Rounds per gun per hour			
	75mm How	105mm How	155mm How	155mm Gun
Advance guard action, development, and deployment	50	50	25	—
Preparation	170	120	50	50
Supporting fires during the attack (observed fires only)	65	50	25	25
Supporting fires during the attack (schedule and observed fires)				
First two hours	140	100	50	50
After two hours	80	60	30	30
Pursuit, exploitation, delaying action, delaying enemy deployment	50	50	25	25
Counterpreparation	170	120	50	50
Defensive fires against infantry attack	140	100	50	50

NOTES: 1. These figures are suitable for short periods of time (2 to 6 hours). For longer periods see Table 19.

2. To compute ammunition for a battalion of light artillery in attack: (20 minute preparation and attack of at least 3 hours).

Preparation—20 minutes = ⅓(12×170) = 680 rds.
Schedule fires—first 2 hrs. = 2(12×140) = 3,360 rds.
third hour = 1(12× 80) = 960 rds.
Total = 5,000 rounds = 10,500 lbs. = 577 boat spaces.

3. To compute hour additional ammunition must be made available at battery positions: Now available—1 unit (300 rds. per piece).

Preparation—20 minutes (⅓×170) = 57 rds.
Schedule fires—1st hour (1×140) = 140 rds.
Expended H + 1 hour = 197 rds.
Remaining = 103 rds.

103/140 = .7 = 42 minutes. Additional ammunition must be made available prior to H + 1 hr and 42 minutes.

TABLE 21

AMMUNITION REQUIREMENTS—SMOKE

Rounds per 100 yards per minute for screening effects only

Wind direction	Following	Head	Flank	Quartering
81mm Mortar	2.1	2.1	1.2	1.5
75mm Howitzer	12	12	6	9
105mm Howitzer	8	8	4	6
155mm Howitzer	3	3	.75	1.5

Above table computed for winds of about 10 mph and favorable weather conditions. Stronger winds or bright sunny weather will increase ammunition expenditure. Smoke is of doubtful value in winds over 20 mph.

TABLE 22

AMMUNITION REQUIREMENTS—CHEMICAL SHELL

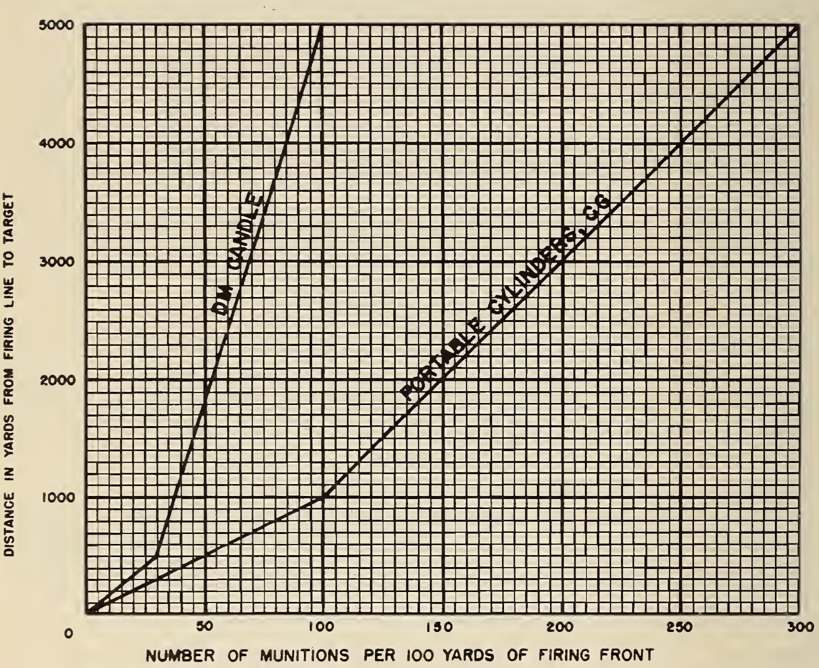
AGENT	HS (a)			CNS (c)			CG (d)		
WEAPON	75mm	155mm	4.2 mortar	75mm	155mm	4.2 mortar	155mm	4.2 mortar	Livens
Rounds per square	80	15	15	5	4	4	25	45	15
Rounds per 200 yard circle	320 (b)	60	60	20	16	16	144 (e)	180	60

NOTES: (a) Table computed for temperature above 50°.
Between 32° and 50° add 25%.
Below 32° use Lewisite.
In densely wooded areas reduce by 25%.
(b) For observed fire—27 minutes for one battery.
For unobserved fire—448 rounds—37 minutes for one battery.
(c) Rounds to maintain density for one hour. Can be fired in 1 to 1½ minutes.
(d) Must be fired in 2 minutes.
(e) Will require 3 batteries to fire in required time.

Determine the number of squares 100 × 100 yards in the target and multiply by the above for the weapon and agent used, or determine the number of circles each 200 yards in diameter and multiply by figures shown above. Where artillery is used, the 200 yard circle method is desirable because of the dispersion of the weapon.

TABLE 23

AMMUNITION REQUIREMENTS—CHEMICAL CLOUD ATTACK



RD. 2823-2

NOTES: 1. Fire one cylinder per yard of front for the first thousand yards in range, and add one-half cylinder per yard of front for each additional thousand yards in range. Maximum effective range 7,500 yards.

2. One-fifth candle per yard of front is required for targets 500 yards away. Add one-fifth candle per yard of front for each additional thousand yards in range. Maximum effective range 5,000 yards.

3. A chemical cloud should be generated on a front as wide as the target to be covered plus 0.2 of the distance to the target; but must be at least one-half as wide as the distance from the firing line to the target. This rule is necessary to provide reasonable certainty of striking all parts of the target with the cloud. The general rule may be modified when the wind is extremely steady, where the target is very large, where terrain features such as valleys will insure the cloud passing directly from the origin to the target without appreciable loss due to the spread, or where the point of release is very close to the target.

TABLE 24

AMMUNITION REQUIREMENTS—AIRCRAFT CHEMICAL MUNITIONS

30-lb Bombs, HS

Bombs per square of area target, 15.
Bombs per 100 yards of occupied road target, 5.
Bombs per 100 yards of road for interdiction, 10.

NOTES:
1. For bombs used on wooded area targets, reduce the quantity 50 percent.
2. For temperatures below 50° F, increase the quantity 25 percent.
3. A "square" measures 100 yards on each side.

CHEMICAL SPRAY TANKS

Chemical spray tanks are filled prior to use and are attached to the bomb racks of the airplane when required.

The 17 gallon nonpressure type of tank is attached to the wing bomb racks of the airplane. It is so constructed that it is emptied in approximately one half mile, regardless of the airplane speed. Once started, its discharge cannot be stopped.

The pressure type tanks, 25 and 50 gallons are attached to the center section bomb rack of the airplane. Its rate of discharge can be varied. Its flow can be started and stopped as desired.

Smoke Screens.—The standard density of smoke screens is considered to be 2 gallons per hundred yards of screen, approximately that produced by the 17 gallon tank.

1 plane with two wing tanks can lay a screen 1,600 yards long or a screen of double density 800 yards long.

1 plane with a 25 gallon tank can lay a screen 1,250 yards long.

1 plane with a 50 gallon tank can lay a screen 2,500 yards long.

The leading edge of a smoke cloud will, as an average, travel at the rate of the ground wind times 1.5, and the trailing edge at the rate of the ground wind times .8, the ground wind being measured at a height of 6 feet.

Chemical Spray.—Length of chemical spray for the various tanks is as given above for smoke screens.

The width of the area covered by chemical spray varies with the height of the plane and the force and direction of the wind. If sprayed across wind the effective width can be considered as 600 yards against unprotected personnel, 300 yards against personnel equipped with the gas mask and 75 yards against fully equipped and well trained troops.

TABLE 25

AMMUNITION REQUIREMENTS—LAND MINES

CHEMICAL

Area	Personnel to emplace	Mines (10 lbs each)	Trucks to Transport (a)	Time to Emplace (b)
100×500 yards	1 squad	200	1 (1½ ton)	8 hours
Road, 1000 yards	1 squad	200	1 (1½ ton)	1 hour (c)

NOTES: (a) Additional trucks are necessary to transport men. Six 10-lb. gas mines packed in a container can be carried over any terrain by two men. 18 mines can be transported on a mortar cart.

(b) At night add 50% to time.

(c) Using time fuze. If electrical ignition is used the time will be doubled.

Purpose	Mines Required
Barriers	Four parallel lines of mines 25 yards apart with mines staggered at 10-yard intervals in each line.
Large areas	Lines of mines 25 yards apart with mines staggered at 20-yard intervals in each line.
In roads	One line of mines on each side of road with mines staggered at 10-yard intervals along each line.
Demolitions	Mines placed in line 5 yards apart at 5-yard intervals along each line.

EXPLOSIVE

1. An antitank minefield, 1,000 yards long, mines laid directly from trucks in 3 to 6 rows, density of 1½ mines per yard of front requires:

Number	1,500 mines		
Weight	7½ tons		
Man-hours (average)		Daylight	Night
Mines laid on surface		20	30
Mines laid and buried, soft soil		80	120
Mines laid and buried, medium soil		100	150
Mines laid and buried, hard soil		200	300

2. If trucks cannot reach and travel along the axis of the mine field, man-hours for carrying mines should be added at the following rates: in daylight, one man can carry 50 mines a distance of 100 yards in one hour at night one man can carry 25 mines a distance of 100 yards in one hour.

TABLE 26

VEHICLES FOR INFANTRY REGIMENT

Type	Mi. Per Day (Est.)	Mi. Per Gal. (Est.)	No. Per Regt	Gal. Per Day (Est.)
Station Wagon	30	12	2	5.
1-Ton Trailer	15	12	1	1.25
¼-Ton 4×4	30	20	55	82.5
1-Ton 4×4 (C)	30	10	8	24.
1-Ton 4×4 (LR)	30	10	1	3.
Gun, 75mm SP	15	1	2	30.
				145.75 (146 Gal. per Day)

TABLE 27

MOTOR FUEL AND LUBRICANT REQUIREMENTS

a. Unit Mile Formula.

(Adapted from U.S. Army Computations.)

1. Based on the number of gallons of gasoline required for the movement of every vehicle of a transport organization or group for the distance of one (1) mile—a so-called **unit mile**—this formula provides an adequate yardstick for the calculation of gasoline requirements for movements involving any given distance. The formula can be expressed as:

Gallons required equals (CF plus MD) times UM.

2. The separate factors of the formula are defined as follows:

CF—a constant factor covering the internal travel and reconnaissance activities of vehicles making up the group. This constant factor is accepted as "10."

MD—is the movement distance contemplated; that is, the mileage involved between the initial location and the destination.

UM—the unit mile as defined in paragraph 1.

3. An example of the working of this formula is as follows:

Situation.—Truck group consisting of twenty-four assorted types of vehicles is to be utilized for the movement of an infantry unit a distance of 80 miles from the entrucking point. By calculation it has been established that it will take eight (8) gallons of gasoline to move this truck group one (1) mile.

Application.—10 (constant factor) plus 80 (movement distance) equals 90 times 8 (unit mile calculated) equals 720 (gallons required).

4. An additional factor included in the calculation of infantry organization motor transport elements by the U.S. Army, is that of supply distance or "SD." This factor covers the vehicles of the infantry supply service in their circulation between railheads and distributing points and the forward new position,—an average of the distances being accepted. As all of the organic vehicles do not have supply missions an arbitrary .4 is taken as the portion of the group so engaged. The formula then reads:

Gallons required equals (CF plus .4SD plus MD) times UM.

5. Motor oil requirements are computed as being 3% of the gasoline figure.

b. Unit Fuel (Lubricant) Requirement.

1. See tables of Basic Allowances. The specifications for each vehicle covers a unit fuel requirement based upon a unit in days at an average mileage per day. The unit lubricant requirement is based upon a predicted mileage factor.

SECTION 3

CHARACTERISTICS OF MATERIAL

TABLE 28

RATION WEIGHT AND MEASUREMENT

Type	Wt.	Cu. Ft.
A—Perishable Component	6.93	.21
B—Dehydrated or Canned Component	5.6	.14
C—6 Cans (2 cans per meal)	4.325	.135
D—Emergency (1 bar per day)	.416	.014
K—3 Boxes (1 box per meal)	2.469	.061

FUEL RATION

WOOD	2 pounds per individual.
GASOLINE	10 gallons per range per day.

GASOLINE: Package contains 2 five gallon tins.

PACKAGE:	10 gals.	88. lbs.	1.5 Cu. Ft.
Drum:	55 gals.	440. lbs.	12. Cu. Ft.

40mm Gun (AA)	1051.	4498.	5549.	120	120	3800	2500	
60mm Mortar, M2	28 w/ Bipod	23. Baseplate	51.	35	18	1985	K	15

TABLE 29

INFANTRY WEAPONS

WEAPON	WEIGHT (LBS.)			MAXIMUM RATE OF FIRE (Rds. Per Min.)	SUSTAINED RATE OF FIRE (Rds. Per Min.)	MAXIMUM RANGE (YDS.)	MAXIMUM EFFECTIVE RANGE (YBS.)	EFFECTIVE RADIUS OF BURST (YBS.)
	Weapon	Mount	Gun and Mount					
U. S. Carbine. Cal. .30, M1	5.			40 (A)	25 (A) (B)	2500	300	
U. S. Rifle. Cal. .30. M1	0.			25	16	3950 (C) 5500 (D)	600	
U. S. Rifle, Cal. .30, M1903	8.69			15	10	3950 (C) 5500 (D)	600	
Automatic Rifle. Cal. .30, M1918 (BAR)	15.875			600 (E) 60 (H)	40	3900 (C) 5500 (D)	600	
Automatic Rifle. Cal. .30, M1918A2 (BAR)	21.			550 (F) 350 (G) 100-150 (I)	100	3950 (C) 5500 (D)	600	
Gun. Machine. Cal. .30. M1917 (W.C.)	33.5 wo/ water 40.75 w/ water	51. (M1917 A1)	84.5	525 (E)	125	3950 (C) 5500 (D)	1800 (J) 3000 (K) (C) 4000 (K) (D)	
Gun. Machine. Cal. .30. M1919A4 (A.C.)	34.	12.	46.	550 (E)	60	3950 (C) 5500 (D)	1800 (J) 3000 (K) (C) 4000 (K) (D)	
Gun. Machine, Cal. .30, Light, Johnson								
Gun. Machine, Cal. .30. Lewis						3950 (C) 5500 (D)	1800 (J)	
Automatic Pistol. Cal. .45, M1911 and M1911A1	2.44 w/ mag.			21	10	1600	50	
Thompson, Submachine Gun, Cal. .45, M1928A1	10.75			600 (E) 100 (H)	100 (I) 40 (H)	1600	350	
Reising Submachine Gun. Cal. 45. w/Folding Stock	6.25			500 (E) 100 (H)	100 (I) 40 (H)	1600	300	
Machine Gun, Cal. .50, M2. H. B. (Flex.) A.C.	79.63	40.5	120.13	500	60	7500	1800 4000	
Machine Gun. Cal. .50. M2. (Flex.) W.C.	94. w/ 36" Barrel wo/ water 100.5 w/ 45" Barrel wo/ water	323.5 M2 Pedestal 391.5 M2 Tripod		650	125	7500	1800 4000	
20mm Gun	283.	1500.	1783.	450	180	5500	1500	
37mm Gun, M3 (AT)	101.	721.	912.	25	20	12,850	1800 (J)	10
37mm Gun. M5 (TK)	185.	515.	700.	25	20	12,850	1800 (J)	10
37mm Gun, M1 A2 (AA)	365.	5000.	5365.	120	120	2500	1500	
40mm Gun (AA)	1051.	4498.	5549.	120	120	3800	2500	
60mm Mortar, M2	28 w/ Bipod	23. Baseplate	51.	35	18	1985	K	15
75mm Gun. M2 A3	1025.	4385.	5410.	6	3	12780	10800	
75mm Pack Howitzer, M1	320.	1220.	1540.	6	3	9490	8000	
81mm Mortar, M1	44.5	46.5 Bipod 45. Baseplate 91.5 Total	135.	35	18	3290 2655	K	15 30
90mm Gun, AA	7088.	10625.	17,714.	25		12375		100
105mm Howitzer	1064.	3171.	4235.	4	2	12150	10300	300
3" Gun, (AA) M3	2302.	14498.	16800.	30	20	10400		80
3"/50 Gun, (AA)								
5"/51 Gun. Mk VIII	10530.	14470.	25000.	8	6	17500	16000	
6"/50 Gun								
7"/45 Gun								
155mm Gun. M1 A1	9595.	20405.	30000.	3	1	26000	22100	560
155mm Howitzer, M1	4260.	7740.	12000.	3	1	16300	13800	550
Rocket Launcher, M1 (AT)	12.5			(A)	(A)	800	400	

NOTES

A. For other than full automatic weapons, personal proficiency is a controlling factor.
B. A variable factor, the time of indurance of which is limited by construction, heating, and other conditions influencing sustained or prolonged performance.
C. M1906 or M2 Ammunition.
D. M1 Ammunition.
E. Cyclic Rate.
F. Normal Cyclic Rate.
G. Slow Cyclic Rate.
H. Semi-Automatic Rate.
I. Automatic Rate.
J. Observed Fire, distance varies with visibility.
K. Indirect Fire, within limit of observation.

TABLE 30

GRENADE CHARACTERISTICS

Type	Weight	Range (Yds)	Use	Effective Radius or Burst
M9A1		75	Antipersonnel Antitank	35
HAND:				
Frag. MkII	20 Oz.	Ind. Ave. 50	Casualty	30
Gas	17 Oz.	"	Harassing	
Offensive	11 Oz.	"	Demolition	
Smoke	17 Oz.	"	Signal	
Thermite	32 Oz.	"	Incendiary	
Frangible	24 to 42 Oz.	"	Incend. & Casualty	5

	ing to om vel-	Piece Transport	Ammunition Transport		Total Weight (approx.) of Piece and Carriage (lbs)
			Kind	Vehicle Capacity (rounds)	
75m H		Hand or Truck	T-4 cart 1½ ton truck with piece 1½ ton truck 2 ton truck	51 60 (a) 100 130	1445
		Tractor or Truck	Caisson 1½ ton truck with piece 1½ ton truck 2 ton truck	70 60 (a) 100 130	2650
A		Tractor or Truck	1½ ton truck 2 ton truck	78 88	16000
1 H		Truck, 4-ton	Truck, 1½ ton Truck, 4-ton Truck, 1-ton	26 70 17	9000
1	rs	10-ton Tractor, Truck, 7½-ton	Truck, 5-ton	70	30081

TABLE 31

CHARACTERISTICS OF ARTILLERY

AMMUNITION							Maximum Effective Range (yards)	Traverse Permitted by Carriage	Rate of Fire Rounds per Piece per Minute		Time to Emplace in Firing Position or to Change From Firing Position to Traveling Position	Piece Transport	Ammunition Transport		Total Weight (approx.) of Piece and Carriage (lbs)
	KIND	No. of Rounds per Box or Bundle	Approximate Weight of Round (lbs)		Area Effectively Covered by Burst (approximate)				Prolonged	Short Bursts			Kind	Vehicle Capacity (rounds)	
			Complete	Projectile and Fuze	Range (yds)	Lateral (yds)									
75mm Pack Howitzer	Shrapnel (fixed) Shell, H.E. (semi-fixed)	3-round bundles or 4-round boxes	20 18	16 14	150 5	25 30	5600 8500	6° 105 mils	3	6 (maximum 20 rds.)	5 minutes	Hand or Truck	T-4 cart 1½ ton truck with piece 1½ ton truck 2 ton truck	51 60 100 (a) 130	1445
75mm Gun	Shrapnel (fixed) Shell, H.E. (fixed) Chemical (fixed)	3-round bundles or 4- or 9-round boxes	20 19 17	16 14 12	150 5	25 30	6700 11250 8100	6° 105 mils	3	6	5 minutes	Tractor or Truck	Caisson 1½ ton truck with piece 1½ ton truck 2 ton truck	70 60 (a) 100 130	2650
3-inch AA Gun	Shrapnel (fixed) Time Shell, H.E. (fixed)	4-round boxes	27 23	-	150 5	25 30	7500 (b) 11000 (b)	360° 6400 mils	25	28	20 to 30 minutes	Tractor or Truck	1½ ton truck 2 ton truck	78 88	16000
155mm Howitzer	Shell (separate loading) Shell, H.E. Chemical Shrapnel		114 114 114	96 97 95	15	70	11000 11000 10800	6° 105 mils	1	3	5 minutes	Truck, 4-ton	Truck, 1½ ton Truck, 4-ton Truck, 1-ton	26 70 17	9000
155mm Gun	Shell (separate loading) Star shell (under development) Shell, H.E. Chemical		148 148	95 97	15	70	13500 16000 16000	60° 1065 mils	1	3	1 to 6 hours	10-ton Tractor, Truck, 7½-ton	Truck, 5-ton	70	30081

NOTES: (a) Included is 10% of load available for AA ammunition.
(b) Vertical range: Shrapnel, 8600 yards; Time Shell, 9300 yards.

NS

of	Weig as Pack (lbs.
ng ope	165
	95
	50 50
	box 225
	box 150
	box 153
	box 85
rds.	box 95
	110
	109

TABLE 32

DEFENSE BATTALION WEAPONS

Item	Weight of gun and mount (Traveling position)	Maximum Horizontal Range		Maximum Vertical range as limited by fuze tracer or director (yds.)	Area Effectively Covered by Burst		Total Traverse (degrees)	Elevation (degrees)		Kind	Ammunition				Time to emplace in firing position or to change from firing position to traveling position.	Piece Transport	Rate of Fire (rds. per minute)	Dimensions for loading		
		(yds.)	As limited by fuze, Tracer or director (yds.)		Range	Lateral		Minimum	Maximum		Method of Packing	Weight as Packed (lbs.)	Wt. of Round Complete (lbs.)	Wt. of Projectile and fuze (lbs.)				Length	Width	Height
7″ (U. S. Navy)	Pedestal Mt. 30T Wt. heaviest breakdown. 15T	16,900					360°	0° —10°	15°	A. P. Field Bombardment	Eyebolt lifting plug and rope grommet	165	271	165	10 days (est.)	Tractor and trailers.	4 rds.			
155mm (M1917, 1918)	28,700 wt.	17,400			15	70	60°	0°	35°	H. E. Chem., Star	″	95	Super 148 Norm 148	95	1 to 6 hours depending on soil.	Tractor Drawn.	3 rds.	29′	9′	6.3′
5″ (U. S. Navy)	27,500 wt. heaviest breakdown 6T.	17,500			15	70	360°	—15°	20°	Common, Flat nose illuminating	″	50 50	97 102	50	1-3 days on advance platform. Depends on soil.	Tractor drawn trailers.	6 rds.	22.5′	5.6′	5.2′
90mm AA	19,000 wt.	15,000 15,900	13,000	11,000 direc. line	102	94	360°	0°	80°	HE, M71, M43A3 Fuze	4 in box	box 225	45.15	23.4	20 min. day, 30 night.	Towing trucks wt. loaded 17 T.	17	20.7′	8.5′	9.3′
3″ AA	16,000 wt.	14,200	11,100	8,350	100	80	360°	—1°	+80°	Mk IX, HE w/Mk III fuze.	4 in box	box 150	23	12.7	20 min. day, 30 night.	Towing trucks 17 T. loaded.	25	24.5′	7.8′	9.2′
40mm AA	5,549 wt.	10,750	3,500 (tracer) 2,500 (Director)	2.500			360° without director. 290° with director.	—6° level w/—11° jacks	+90°		4 clips of 4 in case or 6 clips in metal box.	box 153	4.67	1.96	5 minutes.	Towing truck.	120	18′ 9½″	6′ 0″	6′ 7½″
37mm AA	5,300 wt.	9,600	4,070	3,960			″	0°	+85°		Box of 20.	box 85	HE, M54, 2.62 AP, M59, 3.12	1.34 1.9	5 minutes.	Towing truck.	120	20′ 1″	5′ 9.5″	6′ 8.5″
20mm AA	1,783 wt. Heaviest Load 1578 (Mount, Pedestal)	5,500	3,300	Effective 1200 yds slant range.			360°	—5°	+87°	HE, Mk 2 or 4	Cardboard cylinders 120 rds. in metal box.	box 95	0.53	0.29	4 days, concrete base.	Truck.	450			
.50 cal. AA	485 wt.	7,500	1,850	″			360°	—15°	+68.75°	A. P. Tracer	300 rds. in wooden box.	110 #	.26		5 minutes.	Truck.	500-650			
.30 cal.	31.5 wt.	3,450	1,000	Slant range			360°	—10°	+48°	Ball, A. P. tracer	1500 rds. in wooden box.	109	0.05 #		1 minute.	Truck.	400-525			

TABLE 33

CHARACTERISTICS OF CHEMICAL WEAPONS

	Effective Range (yards)		Rate of Fire (rounds/minute)		Time to emplace (minutes)		Capacity of trucks	
	Maximum	Minimum	Rapid	Prolonged	Day	Night	1½ to 2 ton	
4.2 Cml Mortar	2400	600	20	5	5	10	1 squad and equipment	
Livens Projector	1450	900	Fired once for each emplacement		100 per platoon 2½ hours	100 per platoon 5 hours	15	20

TABLE 34

CHARACTERISTICS OF ARMORED VEHICLES

Vehicle	Weight (tons) (gross) equipped with crew	Armament	Crew	Max. speed on roads, mph	Spanning capacity (feet)	Slope climbing ability (degrees)	Safe fording depth (ins.)	Mileage on one fill (miles)
Tank CLT-3	6	2 MG, 30 cal	2	35	4′ 2″	25 to 30		250
Tank, light	11½	4 MG, 30 cal 1 Gun, 37mm	4	37.5	5′	27	43″	100
Tank, med.	21	8 MG, 30 cal 1 Gun, 37mm	5	26.4	9′	23	53″	195
Scout car	5	1 MG, 50 cal 2 MG, 30 cal 1 TSMG	6	55		30	30″	250

NOTES: (1) As several models of each type vehicle listed are in use, the data contained in this table must be considered as approximate only.

(2) The cross-country speed of the vehicles listed will vary from 5 to 25 miles, depending on the nature of the terrain, whether employed during day or night, and employed at night, whether with or without lights.

TABLE 35
CHARACTERISTICS OF WARSHIPS

TYPE	SYMBOL	NORMAL DISPLACEMENT TONS	MEAN DRAUGHT FEET	MAXIMUM SPEED KNOTS	ARMAMENT				ARMOR		
					MAIN BATTERY		SECONDARY BATTERY		MAIN BELT INCHES	TURRETS OR GUN SHIELDS INCHES	DECK INCHES
					GUNS CALIBER	RANGE YARDS	GUNS CALIBER	RANGE YARDS			
BATTLESHIP	BB	20,000 to 40,000	28-31	20-28	8-12 12"-16"	24,000 to 35,000	12-20 5"-6"	17,000	8-16	9-18	3-6¼
BATTLE CRUISER	CC	27,000 to 42,000	26-29	28-33	6-8 13"-15"	24,000 to 35,000	12-16 4.7"-6"	17,000	6-12	8-15	1-4
AIRCRAFT CARRIER	CV	10,000 to 33,000	18-25	20-35	0-8 4.7"-8"	15,000 to 30,000	Varying 5" or smaller	15,000	0-8	Varying	1-3
HEAVY CRUISER	CA	9,000 to 12,000	20-24	25-35	6-10 8"	25,000 to 35,000	4-8 4"-5"	14,000 to 20,000	2-5	Varying	1-4
LIGHT CRUISER	CL	3,000 to 10,000	14-20	32-35	6-10 5"-7.5"	18,000 to 28,000	4-16 5" or smaller	—	0-5	1½-6	1-4
DESTROYER	DD	1,000 to 2,000	9-13	30-40	4-6 4"-5.5"	15,000 to 17,000	— —	—	—	—	—
SUBMARINE	SS	250 to 3,000	—	11-23	0-2 4"-6"	7,000 to 15,000	— —	—	—	—	—

NOTE:— Practically all vessels carry Anti-Aircraft Machine Guns of 0.30 caliber or larger. Many secondary batteries can be used both as Anti-Aircraft weapons and for Torpedo Defense.

TABLE 36

TECHNICAL CHARACTERISTICS OF AIRCRAFT

NOTE: All speeds and distances are given in nautical miles.
To convert to statute miles multiply by 1.15.
Except for VP type no bombs or cargo can be carried with maximum gas load.

FIGHTING AVIATION (VF)

Maximum speed at rated altitude		300
Cruising speed		225
Hours endurance at cruising speed		4
Range at cruising speed		900
Maximum range		1,200
Crew		1
Bombs	100 lb.	2
Guns	0.50 cal.	4
Ammunition, rounds per gun		430
Radio effective	voice	50
	key	100
Climb in minutes to 20,000 feet		8
Service ceiling, feet		33,000

SCOUT BOMBING AVIATION (VSB)
(SCOUTING MISSIONS)

Maximum speed at rated altitude		220
Cruising speed		160
Hours endurance at cruising speed		9.0
Range at cruising speed		1,440
Maximum range		1,800
Crew		2
Bombs	1,000 lb.	1
	500 lb.	1
	100 lb.	2
	30 lb.	15*
Guns	0.50 cal. fixed	2
	.30 cal. free	1
Ammunition	.50 cal. fixed	400
	.30 cal. free	600
Radio effective	voice	150
	key	300
Service ceiling, feet		28,000

*(If equipped with suitable bomb racks)

SCOUT BOMBING AVIATION (VSB)
(BOMBING MISSION)

Maximum speed at rated altitude		210
Cruising speed		160
Hours endurance at cruising speed		3
Same, maximum gas load (depending on bomb load)		6.4
Range at cruising speed (depending on bomb load)		450-960
Crew		2
Bombs	1,000 lb.	1
	500 lb.	1
	100 lb.	2
Guns	.50 cal. fixed	2
	.30 cal. free	1
Ammunition, rounds per gun	.50 cal. fixed	360
	.30 cal. free	600
Radio effective	voice	150
	key	300
Service ceiling, feet		25,500

MEDIUM BOMBARDMENT AVIATION (VB)

Maximum speed at rated altitude		260
Cruising speed		220
Hours endurance at cruising speed		9
Range at cruising speed		2,000
Maximum range		2,250
Crew		6
Bombs	2,000 lb.	1
	1,100 lb.	2
	600 lb.	4
	300 lb.	6
	100 lb.	12
Guns	combinations of 0.30 cal. flex. and 0.50 cal. flex. and turret types	
Radio effective	key	
	voice	
Service ceiling, feet		25,000

TORPEDO AVIATION (VT)

Maximum speed at rated altitude	270
Cruising speed	200
Hours endurance at cruising speed	3.7
Same, maximum gas load	18.2
Range at cruising speed	772
Same, maximum gas load	2,300
Maximum range	2,460
Crew	3

Bombs	torpedo	1
	1,000 lb.	1
	500 lb.	3
	100 lb.	12
Guns	.30 cal. fixed	1
	.30 cal. free tunnel	1
	.50 cal. free	1
Ammunition, rounds per gun	.30 cal. fixed	500
	.30 cal. free tunnel	500
	.50 cal. free	200
Radio effective	voice	150
	key	300
Service ceiling, feet		34,000

TRANSPORT AVIATION (VR)

Use characteristics shown for VP class. Allow seventeen men with full infantry equipment in each two engine transport in addition to the crew.

PATROL AVIATION (VPB)

Two Engine

		VP	VPB
Maximum speed at rated altitude		195	195
Cruising speed		145	145
Hours endurance at cruising speed		21.6	11.3
Same, maximum gas load		21.6	11.3
Range at cruising speed		3,150	1,640
Same, maximum gas load		3,150	1,640
Maximum range		3,450	1,760
Crew		6	6
Bombs	1,000 lb.	—	6
	500 lb.	2	2
Guns	Cannon, bow	1	1
	.50 cal. tail	1	1
	.50 cal. free	1	1
	.50 cal. side waist	2	2
	.30 cal. tunnel	1	1
Ammunition, rounds per gun	Cannon, bow	400	400
	.50 cal. tail	200	200
	.50 cal. free	400	400
	.50 cal. side waist	400	400
	.30 cal. tunnel	1,200	1,200
Radio effective	voice		
	key		
Service ceiling		22,000	22,000

Four Engine

		VP	VPB
Maximum speed at rated altitude		215	210
Cruising speed		160	155
Hours endurance at cruising speed		19	7.9
Same, maximum gas load		21.7	21.7
Range at cruising speed		3,078	926
Same, maximum gas load		3,470	1,160
Maximum range		3,670	1,260
Crew		8	8
Bombs	1,000 lb.	—	12
Guns	.50 cal.	5	5
Ammunition, rounds per gun	.50 cal.	200	200
Radio effective	voice		
	key		
Service ceiling		25,500	25,500

NOTE: VP types require sheltered water areas for take-off and landing under full load or near full load condition.

TABLE 37

AIRCRAFT CAPABILITIES

1. **Length and Number of Missions.**—No more than six hours of flying in one day will ordinarily be scheduled for missions except that one full mission to the limit of the range prescribed for that airplane may be flown and transport types may be flown to the limit of that equipment, assuming spare crews are available. In case of an emergency the amount of flying in any 48 hours may be increased provided that neither of the following limits is exceeded: (a) 12 hours flying: (b) 8 missions.

2. **Time Between Missions.**—For units of a squadron or more, two hours must elapse after landing for servicing and rearming before they can take off on another mission. Allow one hour for one half squadron and 30 minutes for a section or under. In case rearming is not required, allow half the time mentioned above.

NOTE: For squadron or larger operations, if ten or more hours of flying or six or more missions are accomplished within any 48-hour period, as provided in "length and number of missions," above, at least 18 hours must elapse between the last mission and the beginning of the next.

3. **Conditions of Readiness.**—The following conditions of readiness will be used in the solution of map problems:

Condition one: 15 minutes notice.
Condition two: 30 minutes notice.
Condition three: 1 hours notice.
Condition four: 2 hours notice.

4. **Aircraft and Engine Checks.**—All aircraft and engines must be checked after about 30 hour's flying and before 35 hours. Allow six hours for checks, which may be done at night if facilities are available.

5. **Minimum Size of Landing Fields.**—For any type of airplane there should be a runway with a minimum length of 1,000 yards and a minimum width of 100 yards, laid out in the direction of the prevailing wind, clear of obstructions for several hundred yards at each end. In restricted areas arresting gear and catapaults may be used for properly equipped airplanes. (This distance will have to be increased with increase in the elevation of the landing field.)

TABLE 38

NAVY BOMB CHARACTERISTICS

Type	Weight		Fuze	Use
	Total	Explosive		
30 lb Fragmentation Mk V Mod. 2 (Navy)	33.4 lb.	4.57 lb. T.N.T.	Instantaneous Nose	Personnel & light materiel objectives including airplanes.
100 lb. Demolition Mk I Mod. 3 (Navy)	116 lb.	65 lb. T.N.T.	Ditto	Railway tracks, engines, cars; buildings; ammunition dumps; airplanes.
500 lb. Demolition Mk XII Heavy Case (Armor-piercing) (Navy)	500 lb.	252 lb. T.N.T.	Instantaneous Nose & Tail or Fixed Delay	Same as 100 lb. bombs; submarines; transports; aircraft carriers; destroyers; supply vessels; light cruisers; light steel railway bridges; subways.
500 lb. Demolition Mk III Mod. 1 (Navy)	475.5 lb.	340 lb. T.N.T.		
1,000 lb. Demolition Mk III (Armor piercing)	973 lb.	509 lb. T.N.T.	Ditto	Reinforced concrete bridges supported by piers or suspended by cables; heavy steel railway bridges; cruisers; battleships.
1,000 lb. Demolition Mk V	976 lb.	771 lb. T.N.T.		
Chemical M I (Army)	30 lb.	9.56 lb.	Instantaneous	Personnel; with other bombs to delay repair.

NOTE: A 15-pound bomb is considered to be the equivalent of one 75mm shell. Other demolition and fragmentation bombs may have their equivalents in terms of 75mm shells determined by dividing their weight by 15.

TABLE 39

EFFECTIVENESS OF ARMY DEMOLITION BOMBS AGAINST SPECIFIED OBJECTIVES

Objective	Bomb	Fuze	Point to be attacked	Danger Radius	Probable results from detonation of bombs within danger radius.
(a) Bridge, concrete re-	1,100	Delay	Piers and approach	15 ft.	Displacement of piers and
	300*	taneous	occupied by airplanes.	100 to 125 ft.	wings, crushing ribs. Fragments should cause additional damage.
(k) High masonry dams and spillways.	2,000	Delay	Close to dam on water side.	15 ft.	Should crack dam or cause hole in its side causing collapse in structure.
(l) Concrete docks.	600	Delay	Dock itself or close alongside.	25 ft.	Cause collapse of dock 75—100 ft.

*When the bomb rack arrangement is such that more 100-lb. bombs can be carried than 300-lb. bombs up to or approximating the airplane's weight carrying capacity in bombs, it is preferable to use 100-lb. bombs.

TABLE 39

EFFECTIVENESS OF ARMY DEMOLITION BOMBS AGAINST SPECIFIED OBJECTIVES

Objective	Bomb	Fuze	Point to be attacked	Danger Radius	Probable results from detonation of bombs within danger radius.
(a) Bridge, concrete reinforced and supported wholly by piers.	1,100	Delay	Piers and approach spans of bridge.	15 ft.	Displacement of piers and spans, causing collapse of one or more spans.
(b) Bridge, concrete, reinforced of massive construction supported by piers and suspended by cables.	2,000	Delay	Piers, cable anchorages and tower supports at end of bridge.	15 ft.	Displacement of piers and destruction of anchorages should cause collapse of the main span. Several hits may be required.
(c) Bridge, steel railway light construction.	600	Delay	Piers and approach spans.	15 ft.	Hit alongside pier should undermine foundation causing collapse of pier and span.
Bridge, steel railway heavy construction.	1,100	Delay	Piers and approach spans.	15 ft.	Hit beneath or upon a span should cut girders, causing collapse of span.
(d) Railway engines and cars.	100 300*	Instantaneous	On or alongside target.	10 ft.	Direct hits should cause damage beyond repair. Near hits should disable target so that immediate repairs cannot be made.
(e) Railway tracks.	100 300*	Instantaneous	If a single track, the track itself. If rail center, distribution over entire area desired.	7 ft-100-lb. 9 ft-300-lb.	100-lb. bomb should cut rails and tear up 20 ft. of roadway. 300-lb. bomb should cut rails and tear up 30 ft. of roadway.
(f) Railways—underground (Subways).	600	Delay	On ground above.	15 ft. to either side.	Should penetrate and detonation should cave in roof or cause collapse of walls.
(g) Buildings of steel, brick and concrete construction: latest type of factories, warehouses, rail terminals—in fact, all types of construction except skyscrapers.	100 300*	Delay	Building itself.	Building itself.	Should penetrate floors before detonating—should destroy walls and floors and cause serious fires.
(h) Seacraft: Modern submarine Transport Aircraft carrier Destroyer Supply vessel.	300	Delay	Vessel itself.	20 ft.	Should sink or seriously damage vessel.
(h) Seacraft (Cont'd): Light cruiser	600	Delay	Vessel itself or in water at side of vessel.	25 ft.	Should sink or seriously damage vessel.
Battle cruiser Battleship.	2,000 〃	Delay	Vessel itself or in water at side of vessel.	35-45 ft.	Should sink or seriously damage vessel.
(i) Ammunition dumps.	100 300*	Instantaneous	Distributed over area occupied by dump.	Direct hits on piles of ammunition.	Blast should detonate piles of ammunition.
(j) Airplanes.	100 300*	Instantaneous	Distributed over area occupied by airplanes.	75 to 100 ft. 100 to 125 ft.	Blast should severely damage wings, crushing ribs. Fragments should cause additional damage.
(k) High masonry dams and spillways.	2,000	Delay	Close to dam on water side.	15 ft.	Should crack dam or cause hole in its side causing collapse in structure.
(l) Concrete docks.	600	Delay	Dock itself or close alongside.	25 ft.	Cause collapse of dock 75—100 ft.

*When the bomb rack arrangement is such that more 100-lb. bombs can be carried than 300-lb. bombs up to or approximating the airplane's weight carrying capacity in bombs, it is preferable to use 100-lb. bombs.

TABLE 40

WIRE COMMUNICATION

1. **Surface Line Construction.**—During movement of units in combat, field wire lines are laid hastily on the ground. This type of wire line is termed a surface line. Surface lines must be protected from traffic at command posts, road crossings, or other places where the lines cross traffic lanes. Surface lines are laid loosely in order that the wire may be flat on the ground and sufficient slack provided for repairing breaks and facilitating subsequent changes in the type of construction. At suitable intervals, surface lines are tied into objects such as trees or posts in order to leave sufficient slack and to prevent passing troops and transport from pulling the lines into traffic lanes. When surface lines are routed along a road, the wires must be kept off the traffic lane.

2. **Rate of Laying Wire.**—Under normal conditions, surface lines can be laid at the following rates:

		Miles Per Hour	
By hand, using: Axle RL-27A or Reel Cart RL-16	On roads and trails	Day	2
		Night	1½
	Across country	Day	1
		Night	½
From vehicles, using: Reel Unit RL-26 or Reel Unit RL-31	On roads	Day	5
		Night	3

NOTE: For overhead line construction the above rates will be reduced fifty percent.

TABLE 41

RADIO EQUIPMENT

SET	TYPE SIGNALS	RANGE MILES	FREQUENCY KCS.	POWER SUPPLY TRANSMITTER	ANTENNA	WEIGHT POUNDS	DESCRIPTION & REMARKS
SCR 194	Voice	3 to 5	27,700 to 52,500	Special type battery	Collapsible vertical Sectional vertical	25	Portable pack set replaced by TBY.
SCR 195	Voice	3 to 5	52,800 to 65,800	Special type battery	Collapsible vertical Sectional vertical	25	Portable pack set replaced by TBY.
TBO	CW & Voice	Voice-75 CW-150	Trans. 2,000 to 3,500 Rec. 2,000 to 8,000	Gas engine driven gen. Hand gen. Dynamotor 110v. AC motor gen.	Sectional vertical & horizontal "T" type	108	Portable field patrol radio. Breaks down in three loads. Receiver power from batteries. Replaced by TBX.
TBR	CW,MCW & Voice	HF 1,000 to 2,000 IF 500 to 1,000	Trans. 300 to 18,100 Rec. 30 to 23,000	110v. AC motor gen. Gas engine driven gen. Supplies 110 v. DC.	IF-current-feed Delta connected with counter-poise. HF-single wire voltage-feed with counterpoise.	2,600	Semi-portable used for semi-permanent locations. Replaced by TBW.
TBW	CW,MCW & Voice	100 1,000	350 to 18,000	Gas engine driven gen.	....	850	Semi-portable equipment. Used for semi-permanent locations.
TBX	CW & Voice	Voice-75 CW-150	Trans. 2,000 to 4,525 Rec. 2,000 to 8,000	Gas engine driven gen. Hand driven gen. Dynamotor 110v. AC motor gen.	Sectional vertical & horizontal "T" type.	108	Portable field patrol set. Breaks down in three one-man loads. Receiver power from batteries. Replaces TBO.
TBY	MCW & Voice	Voice-5 MCW-10	28,000 to 80,000	Special type battery.	Sectional vertical.	42	Portable pack set. Replaces SCR-194 & SCR-195.
GF/RU	CW,MCW & Voice	Voice-up to 7.5 CW up to 20	Trans. (CF-5) 300 to 9,050 Rec. (RU-7) 195 to 18,575	Dynamotor by 12v. storage battery.	"T", "L", or "V" types may be used with equal satisfaction.	40	Used in tanks, scout cars, and aircraft.
MO	CW Voice	Voice-10 CW-25	2,300 to 8,200	6v. or 12v. Dynamotor or 110v. AC, 60 cycles.	....	60	Vehicular equipment.
M.P.	Voice	1.5	2,300 4,500	Special type battery.	....	7	Portable pack set.

SECTION 4

MISCELLANEOUS

ENTS

ST AID

othing. Wash
arts of body with
oapy water. Do
ge.

il, hot water, soap
mall area of flesl
n Na OH. Apply
ate paste.

gasoline, hot wat

keep quiet and w
bandages.

and warm. Give
a stimulant.

and warm Give
a stimulant.

om gassed area.
and warm. Give
a stimulant.

with water or bori
ot rub or bandage.
O_2 solution.

with boric acid. D
ge.

pure air and kee
quiet.

pure air, keep qui
ine from bleachin
ttle.

pure air and kee
quiet.

no effect requiring

Soda solution.

no effect requiring

mud to smother.

severe burn.

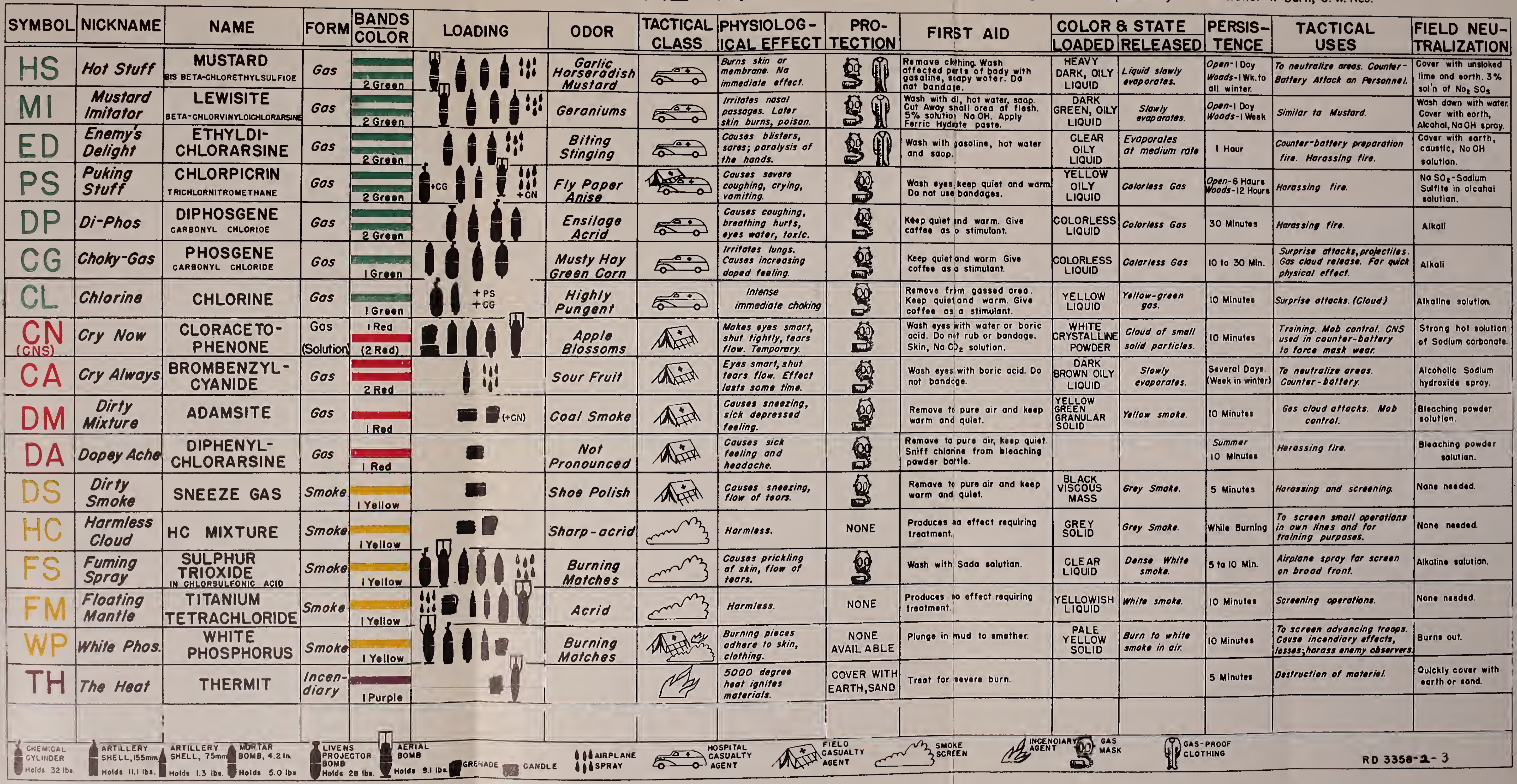
KE
EEN

IN
A

REFERENCE AND TRAINING CHART

CHEMICAL WARFARE AGENTS

Prepared by Lt. Col. Walter P. Burn, C. W. Res.



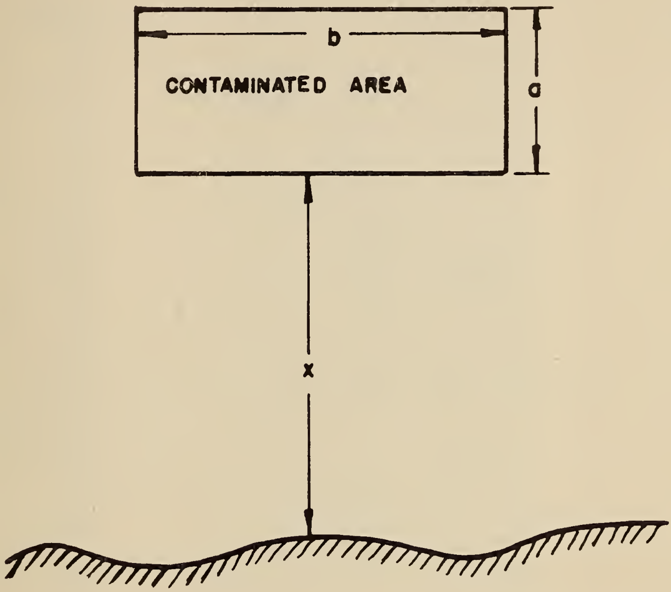
SYMBOL	NICKNAME	NAME	FORM	BANDS COLOR	LOADING	ODOR	TACTICAL CLASS	PHYSIOLOGICAL EFFECT	PROTECTION	FIRST AID	COLOR & STATE		PERSISTENCE	TACTICAL USES	FIELD NEUTRALIZATION
											LOADED	RELEASED			
HS	*Hot Stuff*	MUSTARD BIS BETA-CHLORETHYLSULFIDE	*Gas*	🟩🟩 2 Green		*Garlic Horseradish Mustard*	🚑	*Burns skin or membrane. No immediate effect.*	😷 🥼	Remove clothing. Wash affected parts of body with gasoline, soapy water. Do not bandage.	HEAVY DARK, OILY LIQUID	*Liquid slowly evaporates.*	*Open*-1 Day *Woods*-1 Wk. to all winter.	*To neutralize areas. Counter-Battery Attack on Personnel.*	Cover with unslaked lime and earth. 3% sol'n of Na_2SO_3
MI	*Mustard Imitator*	LEWISITE BETA-CHLORVINYLDICHLORARSINE	*Gas*	🟩🟩 2 Green		*Geraniums*	🚑	*Irritates nasal passages. Later skin burns, poison.*	😷 🥼	Wash with oil, hot water, soap. Cut Away small area of flesh. 5% solution NaOH. Apply Ferric Hydrate paste.	DARK GREEN, OILY LIQUID	*Slowly evaporates.*	*Open*-1 Day *Woods*-1 Week	*Similar to Mustard.*	Wash down with water. Cover with earth, Alcohol, NaOH spray.
ED	*Enemy's Delight*	ETHYLDI-CHLORARSINE	*Gas*	🟩🟩 2 Green		*Biting Stinging*	🚑	*Causes blisters, sores; paralysis of the hands.*	😷 🥼	Wash with gasoline, hot water and soap.	CLEAR OILY LIQUID	*Evaporates at medium rate*	1 Hour	*Counter-battery preparation fire. Harassing fire.*	Cover with earth, caustic, NaOH solution.
PS	*Puking Stuff*	CHLORPICRIN TRICHLORNITROMETHANE	*Gas*	🟩🟩 2 Green	+CG +CN	*Fly Paper Anise*	⛺ 🚑	*Causes severe coughing, crying, vomiting.*	😷	Wash eyes, keep quiet and warm. Do not use bandages.	YELLOW OILY LIQUID	*Colorless Gas*	*Open*-6 Hours *Woods*-12 Hours	*Harassing fire.*	$NaSO_2$-Sodium Sulfite in alcohol solution.
DP	*Di-Phos*	DIPHOSGENE CARBONYL CHLORIDE	*Gas*	🟩🟩 2 Green		*Ensilage Acrid*	🚑	*Causes coughing, breathing hurts, eyes water, toxic.*	😷	Keep quiet and warm. Give coffee as a stimulant.	COLORLESS LIQUID	*Colorless Gas*	30 Minutes	*Harassing fire.*	Alkali
CG	*Choky-Gas*	PHOSGENE CARBONYL CHLORIDE	*Gas*	🟩 1 Green		*Musty Hay Green Corn*	🚑	*Irritates lungs. Causes increasing doped feeling.*	😷	Keep quiet and warm Give coffee as a stimulant.	COLORLESS LIQUID	*Colorless Gas*	10 to 30 Min.	*Surprise attacks, projectiles. Gas cloud release. For quick physical effect.*	Alkali
CL	*Chlorine*	CHLORINE	*Gas*	🟩 1 Green	+PS +CG	*Highly Pungent*	🚑	*Intense immediate choking*	😷	Remove from gassed area. Keep quiet and warm. Give coffee as a stimulant.	YELLOW LIQUID	*Yellow-green gas.*	10 Minutes	*Surprise attacks. (Cloud)*	Alkaline solution.
CN (CNS)	*Cry Now*	CLORACETO-PHENONE	Gas (Solution)	1 Red 🟥 (2 Red)		*Apple Blossoms*	⛺	*Makes eyes smart, shut tightly, tears flow. Temporary.*	😷	Wash eyes with water or boric acid. Do not rub or bandage. Skin, $NaCO_2$ solution.	WHITE CRYSTALLINE POWDER	*Cloud of small solid particles.*	10 Minutes	*Training. Mob control. CNS used in counter-battery to force mask wear.*	Strong hot solution of Sodium carbonate.
CA	*Cry Always*	BROMBENZYL-CYANIDE	*Gas*	🟥🟥 2 Red		*Sour Fruit*	⛺	*Eyes smart, shut tears flow. Effect lasts some time.*	😷	Wash eyes with boric acid. Do not bandage.	DARK BROWN OILY LIQUID	*Slowly evaporates.*	Several Days. (Week in winter)	*To neutralize areas. Counter-battery.*	Alcoholic Sodium hydroxide spray.
DM	*Dirty Mixture*	ADAMSITE	*Gas*	🟥 1 Red	(+CN)	*Coal Smoke*	⛺	*Causes sneezing, sick depressed feeling.*	😷	Remove to pure air and keep warm and quiet.	YELLOW GREEN GRANULAR SOLID	*Yellow smoke.*	10 Minutes	*Gas cloud attacks. Mob control.*	Bleaching powder solution.
DA	*Dopey Ache*	DIPHENYL-CHLORARSINE	*Gas*	🟥 1 Red		*Not Pronounced*	⛺	*Causes sick feeling and headache.*	😷	Remove to pure air, keep quiet. Sniff chlorine from bleaching powder bottle.			*Summer* 10 Minutes	*Harassing fire.*	Bleaching powder solution.
DS	*Dirty Smoke*	SNEEZE GAS	*Smoke*	🟨 1 Yellow		*Shoe Polish*	⛺	*Causes sneezing, flow of tears.*	😷	Remove to pure air and keep warm and quiet.	BLACK VISCOUS MASS	*Grey Smoke.*	5 Minutes	*Harassing and screening.*	None needed.
HC	*Harmless Cloud*	HC MIXTURE	*Smoke*	🟨 1 Yellow		*Sharp-acrid*	☁	*Harmless.*	NONE	Produces no effect requiring treatment.	GREY SOLID	*Grey Smoke.*	While Burning	*To screen small operations in own lines and for training purposes.*	None needed.
FS	*Fuming Spray*	SULPHUR TRIOXIDE IN CHLORSULFONIC ACID	*Smoke*	🟨 1 Yellow		*Burning Matches*	☁	*Causes prickling of skin, flow of tears.*	😷	Wash with Soda solution.	CLEAR LIQUID	*Dense White smoke.*	5 to 10 Min.	*Airplane spray for screen on broad front.*	Alkaline solution.
FM	*Floating Mantle*	TITANIUM TETRACHLORIDE	*Smoke*	🟨 1 Yellow		*Acrid*	☁	*Harmless.*	NONE	Produces no effect requiring treatment.	YELLOWISH LIQUID	*White smoke.*	10 Minutes	*Screening operations.*	None needed.
WP	*White Phos.*	WHITE PHOSPHORUS	*Smoke*	🟨 1 Yellow		*Burning Matches*	⛺ 🔥 ☁	*Burning pieces adhere to skin, clothing.*	NONE AVAILABLE	Plunge in mud to smother.	PALE YELLOW SOLID	*Burn to white smoke in air.*	10 Minutes	*To screen advancing troops. Cause incendiary effects, losses; harass enemy observers.*	Burns out.
TH	*The Heat*	THERMIT	*Incendiary*	🟪 1 Purple			🔥	*5000 degree heat ignites materials.*	COVER WITH EARTH, SAND	Treat for severe burn.			5 Minutes	*Destruction of materiel.*	Quickly cover with earth or sand.

CHEMICAL CYLINDER Holds 32 lbs.
ARTILLERY SHELL, 155mm Holds 11.1 lbs.
ARTILLERY SHELL, 75mm Holds 1.3 lbs.
MORTAR BOMB, 4.2 In. Holds 5.0 lbs
LIVENS PROJECTOR BOMB Holds 28 lbs.
AERIAL BOMB Holds 9.1 lbs.
GRENADE
CANDLE
AIRPLANE SPRAY
HOSPITAL CASUALTY AGENT
FIELD CASUALTY AGENT
SMOKE SCREEN
INCENDIARY AGENT
GAS MASK
GAS-PROOF CLOTHING

RD 3358-2-3

TABLE 42

GUIDE FOR USE OF HIGHLY PERSISTENT VESICANTS



Notes:

x = safe distance from our lines to near edge of contaminated area.

a = depth of area in direction of fire.

b = width of area.

This equation does not apply in the case of barriers less than 500 yards in depth; however, such barriers ordinarily will not be placed closer than 1000 yards to friendly troops.

RD. 2823-2

TABLE 43

STANDARD NOMENCLATURE LIST AUTHORIZED FOR NAVAL VESSELS

(Alphabetical by Symbol)

TYPE	CLASS	SYMBOL
Auxiliary	Crane Ships	AB
	Collier	AC
	Auxiliary Aircraft Carriers	ACV
	Destroyer Tenders	AD
	Ammunition Ships	AE
	Provision Store Ships	AF
	Misc. Auxiliary Ships	AG
	Seagoing Dredges	AGD
	Lighthouse Tenders	AGL
	Surveying Ships	AGS
	Hospital Ships	AK
	Cargo Ships	AK
	Deep Hold Cargo Ships	AKD
	Net Cargo Ships	AKN
	General Stores Issue Ships	AKS
	Lightships	AL
	Large Mine Sweepers	AM
	Base Mine Sweepers	AMc
	Coastal Mine Sweepers	AMc
	Net Laying Ships	AN
	Oilers	AO
	Base Oilers	AOB
	Gasoline Tankers	AOG
	Transports	AP
	Animal Transports	APA
	Artillery Barges	APB
	Coastal Transports	APc
	Cavalry Transports	APC
	Fast Transports	APD
	Administration Flagships	APF
	Supporting Gunnery Ships	APG
	Transports fitted for evacuation of wounded	APH
	Barracks Ships	APL
	Mechanized Artillery Transport (now LSD)	APM
	Non-Mechanized Artillery Transports	APM
	Troop Barges, Class A	APP
	Rescue Transports	APR
	Troop Barges, Class B	APT
	Seaplane Carriers	APV

	Giant "Y" Craft (now LCI(L))	APY
	Repair Ships	AR
	Base Repair Ships	ARb
	Cable Repairing or Laying Ships	ARC
	Floating Dry Docks	ARD
	Hull Repair Ships (heavy)	ARH
	Heavy Machinery Repair Ships	ARM
	Salvage Vessels	ARS
	Aircraft Repair Ships	ARV
	Submarine Tenders	AS
	Submarine Rescue Vessels	ASR
	Tugs - Auxiliaries	AT
	Tank Landing Vessels (now LST)	ATL
	Rescue Tugs	ATR
	Salvage Tugs	ATS
	Seaplane Tenders (large)	AV
	Catapult Lighters	AVC
	Seaplane Tenders, Destroyers	AVD
	Seaplane Tenders (small)	AVP
	Aircraft Rescue	AVR
	Distilling Ships	AW
	Water Tankers	AWK
	Airship Tenders (lighter than air)	AZ
Battleship	Battleships	BB
Cruiser	Heavy Cruisers	CA
	Large Cruisers	CB
	Battle Cruisers	CC
	Flying Deck Cruisers	CF
	Light Cruisers	CL
	Mine Layers	CM
	Coastal Mine Layers	CMc
Aircraft Carrier	Aircraft Carriers	CV
	Seaplane Carriers	CVS
Destroyer	Destroyers	DD
	Escort Vessels (Destroyers)	DE
	Destroyer Leaders	DL
	Light Mine Layers (high speed)	DM
	Mine Sweepers (high speed)	DMS
Landing Craft (*see note below)	Landing Craft, Infantry (large) (fmr. APY)	*LCI
	Landing Craft Mechanized, Mk II (fmr. TLL)	**LCM(2)
	Landing Craft, Mechanized, MK III (Fmr. TLM, TLWL, & TLWM) (Well Type & Bu. Design Tank Lighter)	LCM(3)
	Landing Craft, Personnel (large) (fmr. LHP)	LCP(L)

	Landing Craft, Personnel (with ramp) (fmr. LHP)	LCP(R)
	Landing Craft, Rubber (large) (fmr. RB-10)	LCR(L)
	Landing Craft, Rubber (small) (fmr. RB-7)	LCR(S)
	Landing Craft, Support (small) (fmr. LBS)	LCS(S)
	Landing Craft, Tank, MkV (fmr. YTL)	LCT(5)
	Landing Craft, Vehicle (fmr. LBV)	LCV
	Landing Ship, Dock (fmr. APM-Mechanized Artillers Trans.)	*LSD
	Landing Ship, Tank (fmr. ATL) (ocean-going)	***
	Landing Vehicle, Tracked (armored) (fmr. TAA)	LVT(A)
	Landing Vehicle, Tracked (unarmored) (fmr. TA)	LVT
	Amphibian Truck (fmr. TKA)	***
Plastic Surf Boat	Submarine Chasers	PC
	Eagle Boats	PE
	Gun Boats	PG
	Diver Gun Boats	PR
	Motor Torpedo Boats	PT
	Submarine Chasers (motor boats)	PTC
	Converted Yachts	PY
	Coastal Yachts	PYc
Submarine	Mine Laying Submarines	SM
	Submarines	SS
District Craft (*see note below)	Ash Lighters	YA
	Misc. District Auxiliaries	YAG
	Open Lighters	YC
	Car Floats	YCF
	Cargo Lighters (open)	YCK
	Aircraft Trans. Lighters	YCV
	Floating Derricks	YD
	Diving Tenders	YDT
	Ammunition Lighters	YE
	Covered Lighters: Range Tenders	YF
	Ferry Boats & Launches	YFB
	Floating Dry Docks	YFD
	Torpedo Transportation Lighters	YFT
	Garbage Lighters	YG
	Ambulance Boats	YH
	House Boats	YHB
	Heating Scows	YHT
	Landing Lighters (open)	YLA
	Dredges	YM
	Motor Mine Sweeper	*YMS

Motor Tugs	*YMT
Net Tenders	*YN
Gate Vessels	*YNG
Net Tenders (tug class)	YNT
Fuel Oil Barges	YO
Gasoline Barges	YOG
Oil Storage Barges	YOS
District Patrol Vessels	YP
Floating Pile Drivers	YPD
Pontoon Stowage Barges	YPK
Floating Workshops	*YR
Submarine Rescue Chambers	YRC
Stevedoring Barges	YS
Seaplane Wrecking Derricks	YSD
Salvage Pontoons	YSP
Sludge Removal Barges	YSR
Harbor Tugs	YT
Tank Lighters (now LCT(5))	YTL
Torpedo Testing Barges	YTT
Water Barges	YW

* Allowance List maintained for these vessels.
** No longer under construction.
*** Assignment of symbol pending.

Aircraft (Heavier-than-Air)	**Bombing**	**VB**
	Observation	**VO**
	Fighting	**VF**
	Torpedo	**VT**
	Scouting	**VS**
	Patrol	**VP**
	Utility	**VJ**
	Training	**VN**
	Experimental	**VX**
Airship (Lighter-than-Air)	Rigid airship:	
	Scouting	**ZRS**
	Patrol	**ZRP**
	Training	**ZRN**
	Nonrigid:	
	Observation	**ZNO**
	Scouting	**ZNS**
	Patrol	**ZNP**
	Training	**ZNN**
	Kite balloon and balloon:	
	Observation	**ZKO**
	Training	**ZKN**
	Metal, experimental	**ZMX**

"X" before a class indicates that it is a merchant ship converted to that type.

"O" before any class designation represents obsolescent vessel.

TABLE 44

LIST OF AUTHORIZED ABBREVIATED TITLES OF FREQUENT USE

Advanced Carrier Training Group	ACTG
Atlantic Fleet Anti-Submarine Warfare Unit	LantFlt ASW Unit
Anti-Submarine Warfare Unit (location)	ASW Unit (location)
Board of Inspection and Survey	INSURV
Chief of Naval Operations	OpNav
Chief of Naval Personnel	BuPers
Chief of the Bureau of Aeronautics	BuAer
Chief of the Bureau of Medicine and Surgery	BuMed
Chief of the Bureau of Ordnance	BuOrd
Chief of the Bureau of Ships	BuShips
Chief of the Bureau of Supplies and Accounts	BuSandA
Chief of the Bureau of Yards and Docks	BuDocks
Commandant Coast Guard	ComdtCoast Guard
Commandant Eleventh Naval District	ComEleven
Commandant Eighth Naval District	ComEight
Commandant Fifteenth Naval District	ComFifteen
Commandant Fifth Naval District	ComFive
Commandant First Naval District	ComOne
Commandant Fourteenth Naval District	ComFourteen
Commandant Fourth Naval District	ComFour
Commandant Navy Yard Boston	ComdtNyBos
Commandant Navy Yard Charleston	ComdtNyCharl
Commandant Navy Yard New York	ComdtNyNyk
Commandant Navy Yard Norfolk	ComdtNyNor
Commandant Navy Yard Philadelphia	ComdtNyPhil
Commandant Navy Yard Portsmouth, N. H.	ComdtNyPort
Commandant Navy Yard Washington, D. C.	ComdtNyWash
Commandant Ninth Naval District	ComNine
Commandant N.O.B. Bermuda	ComdtNOB Bermuda
Commandant N.O.B. Guantanamo Bay, Cuba	ComdtNOBGtmo Bay
Commandant N.O.B. Iceland	ComdtNOBIceland
Commandant N.O.B. Argentina, Newfoundland	ComdtNOB Argentia
Commandant N.O.B. Newport	ComdtNOB Newport
Commandant N.O.B. Trinidad	ComdtNOB Trinidad
Commandant Seventh Naval District	ComSeven
Commandant Sixteenth Naval District	ComSixteen
Commandant Sixth Naval District	ComSix
Commandant Tenth Naval District	ComTen
Commandant Thirteenth Naval District	ComThirteen

Commandant Third Naval District	ComThree
Commandant Twelfth Naval District	ComTwelve
Commandant U. S. Marine Corps	ComdtMarCorps —CMC
Commander All Forces Aruba Curacao	CAFAC
Commander Amphibious Force, Atlantic Fleet	ComAmphForLant
Commander Amphibious Force, Pacific Fleet	ComAmphForPac
Commander Battleships, Atlantic Fleet	ComBatShipsLant
Commander Battleships, Pacific Fleet	ComBatShipsPac
Commander Battleship Division (number)	ComBatDiv—
Commander Carriers, Atlantic Fleet	ComCarLant
Commander Carriers, Pacific Fleet	ComCarPac
Commander Carribbean Sea Frontier	ComCaribSeaFron
Commander Cruiser Division (number)	ComCruDiv—
Commander Cruiser Scouting Squadron (number)	ComCruScoRon—
Commander Cruisers, Atlantic Fleet	ComCruLant
Commander Cruisers, Pacific Fleet	ComCruPac
Commander Destroyers, Atlantic Fleet	ComDesLant
Commander Destroyer Flotilla (number)	ComDesFlot—
Commander Destroyers, Pacific Fleet	ComDesPac
Commander Destroyers, Southwest Pacific Force	ComDesSWPacFor
Commander Destroyer Squadron (number)	ComDesRon—
Commander Eastern Sea Frontier	ComEastSeaFron
Commander Experimental Division (number)	ComExDiv
Commander Greenland Patrol	ComGrePat
Commander Gulf Sea Frontier	ComGulfSeaFron
Commander Hawaiian Sea Frontier	ComHawSeaFron
Commander in Chief, U. S. Atlantic Fleet	CinCLant
Commander in Chief, U. S. Fleet	CominCh
Commander in Chief, U. S. Pacific Fleet	CinCPac
Commander in Chief, Western Approaches	CinCWA
Commander Mine Squadron (number)	CominRon—
Commander Northwest Sea Frontier	ComNoWestSeaFron
Commander Operational Training Squadron, Pacific Fleet	ComOpTrainRonPac
Commander Operational Training Squadron, Atlantic Fleet	ComOpTrainRonLant
Commander Panama Sea Frontier	ComPaSeaFron
Commander Patrol Wing (number)	ComPatWing—
Commander Patrol Wings, Atlantic Fleet	ComPatWingLant
Commander Patrol Wings, Pacific Fleet	ComPatWingsPac
Commander Patrol Wings, Southwest Pacific Force	ComPatWingSWPacFor
Commander Service Force, Atlantic Fleet	ComServForLant
Commander Service Force, Pacific Fleet	ComServForPac
Commander Service Squadron (number)	ComServRon—
Commander Southeast Pacific Force	ComSEPacFor

Commander Southwest Pacific Force	ComSWPacFor
Commander Submarines Atlantic Fleet	ComSubLant
Commander Submarine Division (number)	ComSubDiv—
Commander Submarines, Southwest Pacific Force	ComSubSWPacFor
Commander Submarines Pacific Fleet	ComSubPac
Commander Submarine Squadron (number)	ComSubRon—
Commander Transport Division (number)	ComTransDiv—
Commander Task Force, (number)	CTF—
Commander Task Group, (number)	CTG—
Commander Task Unit, (number)	CTU—
Commander Transports, Amphibious Force, Atlantic Fleet	ComTransAmphForLant
Commander Transports Amphibious Force, Pacific Fleet	ComTransAmphForPac
Commander Utility Wing, Service Force, Atlantic Fleet	ComUtWingServForLant
Commander Utility Wing, Service Force, Pacific Fleet	ComUtWingServForPac
Commander Utility Squadron (number)	ComUtRon—
Commander Western Sea Frontier	ComWestSeaFron
Commanding General, Amphibious Corps, Atlantic Fleet	ComGenAmphCorpsLant
Commanding General, Amphibious Corps, Pacific Fleet	ComGenAmphCorpsPac
Commanding Officer	CO (orComdgOf)
Commanding Officer, Atlantic Coast	COAC
Commanding Officer, Observation Squadron (no.)	COObsRon—
Director Naval Communications	DNC
Director Naval Intelligence	DNI
Director of Fleet Training	DFT
Director, Shore Establishment Division	SOSED
Escort Scouting Squadron	EscoRon
Flag Office, Commanding Newfoundland Forces	FONF
Fleet Aircraft Photographic Unit	APULant (Pac)
Fleet Aircraft Tactical Unit	APULant (Pac)
Headquarters, Department of the Pacific, USMC	MarPac
Headquarters, U. S. Marine Corps	MarCorps
Inspection Naval Aircraft	InsAir
Inspection Naval Material	InsMat
Inspection of Ordnance in Charge	InsOrdinC
Mobile Target Division	MoTarDiv
Naval Air Station (location)	NAS
Naval Ammunition Depot	NAD
Naval Gun Factory	NavGun
Naval Inspector General	Insgen

Naval Inspector of Ordnance	InsOrd
Naval Service Headquarters (location)	NSHQ—
Naval Transportation Service	NTS
Officer in Charge	OinC
Officer in Tactical Command	OTC
Registered Publication Section	RPS
Research Laboratory	ResLab
Senior Officer Present Afloat	SOPA
Service Force Subordinate Command, Atlantic Fleet	ServForSubord ComLant
Submarine Base (location)	SubBase—
Supervisor of Ship Building	SupShip
The Chairman, General Board	ChGenBd
The Commander U. S. Naval Forces Europe	ComNavEu
The Hydrographer	Hydro
The Judge Advocate General	JAG
The President, U. S. Naval War College	PresNWC
Transition Training Squadron	TranTrainRon
United States Army Transport	USAT
United States Coast Guard	USCG
United States Coast Guard Cutter	USCGC
United States Marine Corps	USMC
United States Naval Academy	USNA
United States Naval Reserve	USNR
U. S. Naval Attache, (location)	ALUSNA
U. S. Naval Liaison Officer (location)	ALUSLO
U. S. Naval Observer, (location)	ALUSNOB
Vice Chief of Naval Operations	VOpNav

TABLE 45

PHONETIC ALPHABET

(Effective 1 Jan. 1943)

A — ABLE
B — BAKER
C — CHARLIE
D — DOG
E — EASY
F — FOX
G — GEORGE
H — HOW
I — ITEM
J — JIG
K — KING
L — LOVE
M — MIKE
N — NAN
O — OBOE
P — PETER
Q — QUEEN
R — ROGER
S — SUGAR
T — TARE
U — UNCLE
V — VICTOR
W — WILLIAM
X — XRAY
Y — YOKE
Z — ZEBRA

TABLE 46

HOURS OF SUNRISE AND SUNSET

For use in problems, the following is taken as the hours of sunrise and sunset at Gettysburg, Pa. Daylight is assumed to begin one hour before sunrise and to end one hour after sunset.

Month	Sunrise a.m.	Sunset p.m.	**Month**	Sunrise a.m.	Sunset p.m.
January:			July:		
1 to 10	7:30	4:55	1 to 10	4:45	7:45
11 to 20	7:30	5:05	11 to 20	4:50	7:40
21 to 31	7:25	5:20	21 to 31	5:00	7:30
February:			August:		
1 to 10	7:15	5:30	1 to 10	5:10	7:20
11 to 20	7:05	5:45	11 to 20	5:20	7:10
21 to 28	6:50	5:55	21 to 31	5:30	6:55
March:			September:		
1 to 10	6:40	6:05	1 to 10	5:40	6:35
11 to 20	6:20	6:15	11 to 20	5:50	6:20
21 to 31	6:05	6:30	21 to 30	6:00	6:00
April:			October:		
1 to 10	5:45	6:40	1 to 10	6:10	5:45
11 to 20	5:30	6:50	11 to 20	6:20	5:30
21 to 30	5:15	7:00	21 to 31	6:30	5:15
May:			November:		
1 to 10	5:05	7:10	1 to 10	6:40	5:00
11 to 20	4:55	7:20	11 to 20	6:55	4:50
21 to 31	4:45	7:30	21 to 30	7:10	4:45
June:			December:		
1 to 10	4:40	7:35	1 to 10	7:15	4:40
11 to 20	4:35	7:40	11 to 20	7:25	4:40
21 to 30	4:40	7:45	21 to 31	7:30	4:45

NOTE: This table also applies to Quantico and vicinity.

TABLE 47

MISCELLANEOUS REFERENCE DATA

1. **Frontage.**—Frontage, both in the attack and the defense will vary between wide limits depending on the type of terrain, the amount of artillery and other support, the type of operation or situation, and the enemy strength, armament and dispositions. The following figures are given simply as general guides for the frontage of interior marine units in attack and defense:

Attack:	**Frontage in yards.**
Squad	50-75
Platoon	100-200
Company	200-500
Battalion	500-1,000
Regiment	1,000-2,000
Defense:	
Platoon	200-400
Company	400-600
Battalion	800-1,500
Regiment	2,000-3,000

From the point of view of the higher commander, the frontage his command is assigned is measured by the number of battalions employed in the assault or on the main line of resistance

NOTE: Frontage in the defense, in the above table, does not take into account the employment of extra machine guns. When extra machine guns are employed, frontages may be correspondingly increased.

2. **Data Upon Which to Compute the Hour of Attack.**—

a. The time required by the commander and his subordinate commanders (to include platoon leaders), in turn, to make their reconnaissances and issue their orders for the attack will vary greatly in different situations. The following are reasonable time assumptions for determining the earliest hour of attack:

—for a division	3 hours 15 minutes
—for a regiment	2 hours 15 minutes
—for a battalion	1 hour 15 minutes

b. No attack can be launched in less time than is required by the rearmost element of the attacking force to move from the point where it received the orders to the line of departure. This time for movement will indicate the earliest hour at which an attack can be launched provided it equals or exceeds the time required for the issue and distribution of attached orders.

c. Time elements within the Battalion:

Battalion Commander's reconnaissance and preparation of oral order (after arrival in vicinity of line of departure)	20 min
Issuance of oral orders	15 min
Company Commander's reconnaissance	10 min
Company Commander's orders, platoon reconnaissance, platoon orders	15 min
Deployment of Companies	15 min
Total	75 min

3. Boundaries.—

a. It is usually desirable to plan both the attack and the defense so as to take advantage of the terrain. Critical areas require a unity of command and are delineated by boundaries.

In the attack, the critical areas are usually the avenues of approach, with boundaries generally falling near or along the crests of the ridges.

In the defense, the critical areas are usually the tactical localities which must be held to insure the integrity of the position. Within the defensive position boundaries are generally placed between the ridges and the stream lines so that each tactical locality and approach is assigned to one unit. Forward of the MLR the boundaries are usually placed near or along the ridges so that the troops can fire on targets that they can see at the longer ranges.

b. **Attack.**—From in rear of the rearmost unit (or far enough to the rear to give each unit the road net to reach its position without interruption) and as far forward as the commander can forsee the development of the action. When a limited objective is given, extend the boundaries, sufficiently to the front so that units may coordinate defense.

c. **Defense.**—Boundaries between units extend from the rearmost parts of the position for which the units are responsible and as far forward of the MLR as the effective range of the weapons with which the units are armed.

TABLE 48

MISCELLANEOUS UNITS AND EQUIVALENTS

LENGTH

1 arshin (Russia) = .77 yards = 28 inches.
1 centimeter = .3937 inches.
1 cho (Japan) = 119.303 yards.
1 foot = .3048 meters.
1 inch = 2.54 centimeters.
1 kilometer = .62137 miles = 1093.61 yards.
1 meter = 39.37 inches =3.28 feet = 1.094 yards.
1 mile = 1.609 kilometers.
1 pic (Egypt) = 2.466 feet.
1 sagene (Russia) = 7 feet.
1 verst (Russia) = 1166.65 yards.

VOLUME

1 bushel = .35242 hectoliters.
1 cubic centimeter = .061 cubic inches.
1 cubic foot = .02832 cubic meters.
1 gallon = 3.785 liters.
1 gallon (England) = 1.2 gallon (U.S.) = 1 imperial gallon.
1 hectoliter = 2.8375 bushels = 90.8 quarts (dry).
1 jarra (Mexico) = 8.68 quarts.
1 kokon (Japan) = 1.578 quarts.
1 kokon oats (Japan) = 1.55 cwt.
1 kokon barley (Japan) = 2.066 cwt.
1 kokon rice (Japan) = 2.805 cwt.
1 liter = 1.0567 quarts (liquids).
1 cubic meter = 1.308 cubic yards = 35.316 cubic feet.
1 quart (liquid) = .946 liters.
1 stere = 1.0 cubic meters (wood) = .2759 cords.
1 to (Japan) = 0.51 bushels = 4.77 gallons.
1 vedro (Russia) = 3.25 gallons.
1 cubic yard = .765 cubic meters.

AREA

1 acre = 4,049 square meters = 43,560 square feet.
1 arpent (Canada) = .845 acres.
1 cho (Japan) = 2.45 acres.
1 deciatine (Russia) = 2.699 acres.
1 hectare = 2.471 acres.
1 joch (Austria) = 1.4 acres.
1 manzana (Central America) = 1.726 acres.
1 morgen (Prussia) = ⅝ acres.

WEIGHT

1 arroba (Cuba) = 25.358 pounds.
1 arroba (Mexico) = 25.366 pounds.
1 bale of cotton (U.S.) = 500 lbs. (gross).
1 bale of cotton (India) = 400 lbs. (gross).
1 bale (Turkey) = 280 pounds.
1 barrel flour (U.S., Canada) = 196 pounds.
1 bushel of oats = 32 pounds (U.S.)
1 bushel barley = 48 pounds.
1 cental = 100 pounds.
1 centner (Germany, Austria, Denmark) = 110.23 pounds.
1 cwt. (England) = 112.0 pounds.
1 fanega (Spain) = 1.6 bushels.
1 kilogram = 2.20463 pounds.
1 kin (Japan) = 1.323 pounds.
1 kwan (Japan) = 8.267 pounds.
1 livre = .5 kilograms.
1 lood (Holland) = 10 grams.
1 minot (Canada) = 1.11 bushels.
1 pikul (China) = 133.276 pounds.
1 pikul (Japan) = 36.1129 pounds.
1 pound = .45359 kilograms.
1 pund (Sweden) = .937.
1 quintal = 220 pounds.
1 ton (England) = 2240 pounds.
1 metric ton = 2204 pounds.
1 zentner (Germany) = 110.23 pounds.

TEMPERATURE

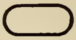
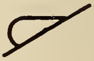
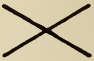
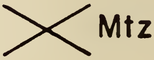
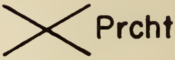
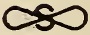
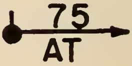
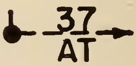
1 degree centigrade = 1.8 Fahrenheit.
1 degree Reaumur = 2.25 Fahrenheit.

CONVENIENT APPROXIMATE RULES

Decimeter x4 = inches.
Meters x3⅓ = feet.
Meters + 10% = yards.
Kilometers x⅝ = miles.

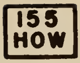
TABLE 49

1. The following symbols have been added to those shown in BFM 21-30, by a War Department change in that publication.

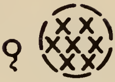
Armored Force (when used with any arm or service symbol indicates mechanized unit.)	
Cavalry, horses and mechanized	
Infantry	
Motorized	
Parachute	
Military Police	MP
Signal Corp, Aviation	
Antitank gun in position showing principal direction of fire	
Antitank gun emplacement with principal direction	

RD 2823-2

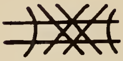
Barrage, (size indicates extent;
notation indicates type)



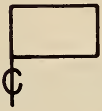
Mines, individual, layout or area
included shown to scale



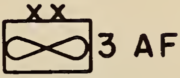
Obstacle, bridge out



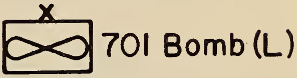
Switching central at command post



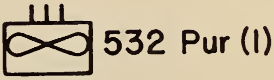
3d Air Force



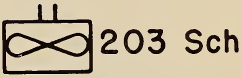
701st Bombardment Wing, (Light)



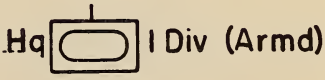
532d Pursuit Group, (Interceptor)



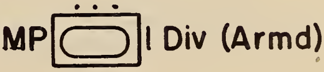
203d School Squadron



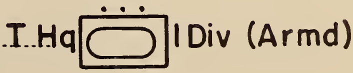
Headquarters Company,
1st Armored Division



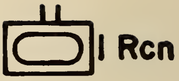
Military Police Platoon,
Headquarters Company,
1st Armored Division



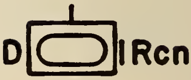
Transportation Platoon,
Headquarters Company,
1st Armored Division



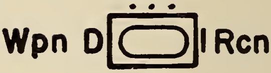
1st Reconnaissance Battalion ....



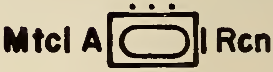
Rifle Company,
1st Reconnaissance Battalion ......



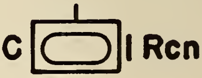
Weapons Platoon,
1st Reconnaissance Battalion ....



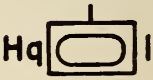
Motorcycle Platoon,
1st Reconnaissance Battalion ....



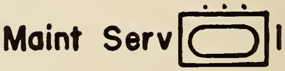
Armored Company, (Light),
1st Reconnaissance Battalion ....



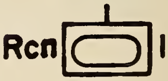
Headquarters Company,
1st Armored Regiment,



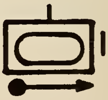
Maintenance Platoon,
Service Company,
1st Armored Regiment,



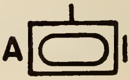
Reconnaissance Company,
1st Armored Regiment,



Machine-Gun Company,
1st Armored Regiment,

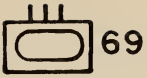


Company A,
1st Armored Regiment,

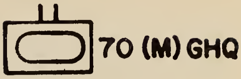


RD2823-2

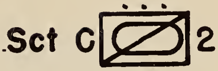
69th Armored Regiment,



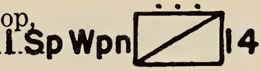
70th Tank Battalion, GHQ Reserve



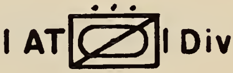
Scout-car Platoon 2d Cavalry



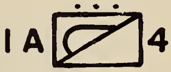
1st Platoon, Special Weapons Troop, 14th Cavalry



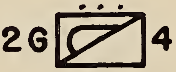
1st Platoon, Antitank Troop, 1st Cavalry Division



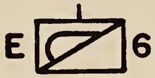
1st Platoon, Troop A, 4th Cavalry, Horse and Mechanized



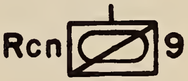
2d Platoon, Troop G, (Motorcycle), 4th Cavalry, Horse and Mechanized



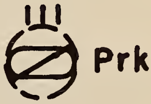
Troop E, (Scout Car), 6th Cavalry, Horse and Mechanized



Reconnaissance Troop, (Mechanized), 9th Division

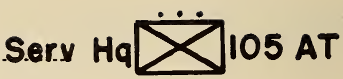


Park, mechanized units of horse cavalry regiment

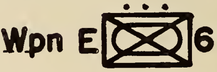


RD 2823-2

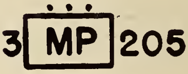
Service Platoon,
Headquarters Company,
105th Antitank Battalion ....



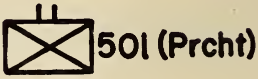
Weapons Platoon,
Company E, 6th Infantry,
Armored ....



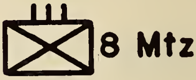
3d Platoon,
205th Military Police Company ......



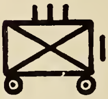
501st Infantry Battalion,
(Parachute) ....



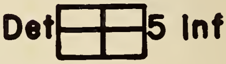
8th Infantry, (Motorized) ....



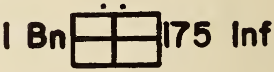
1st Infantry Train ....



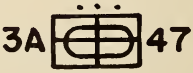
Medical Detachment, 5th Infantry ....



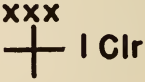
1st Battalion Section,
Medical Detachment,
175th Infantry ....



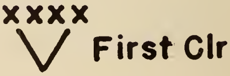
3d Platoon, Collecting Company,
47th Medical Battalion, Armored ..



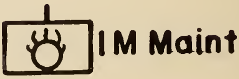
Clearing Station, I Corps ....



Veterinary Clearing Station,
First Army ....

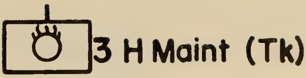


1st Ordnance Company,
Medium Maintenance ....

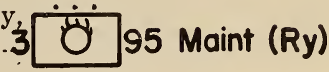


RD 2823-2

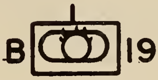
3d Ordnance Company,
Heavy Maintenance, Tank ....



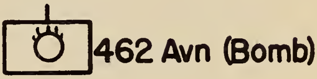
3d Platoon, 95th Ordnance Company,
Maintenance, Railway Artillery ..



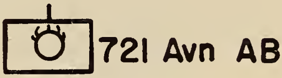
Company B, 19th Ordnance
Battalion, Armored ....



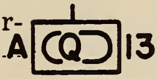
462d Ordnance Company,
(Aviation, Bombardment) ....



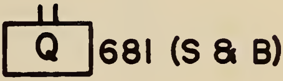
721st Ordnance Company,
(Aviation Air Base) ....



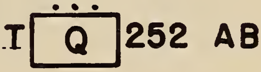
Company A, (Truck), 13th Quartermaster Battalion, (Armored) ......



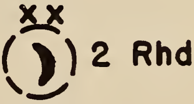
681st Quartermaster Battalion,
(Sterilization and Bath) ....



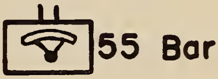
Transportation Platoon,
252d Quartermaster Company,
(Air Base) ....



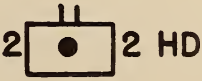
Railhead, Class I, Supply,
2d Division ....



55th Balloon Barrage Battalion ....

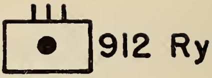


2d Battalion, 2d Coast Artillery,
Harbor Defense ....

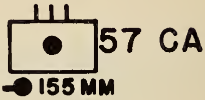


RD 2823-2

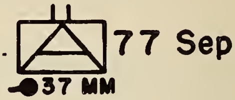
912th Coast Artillery, Railway



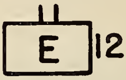
57th Coast Artillery, 155mm gun



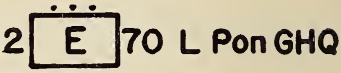
77th Separate Coast Artillery
Battalion, (AA, 37mm)



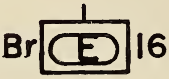
12th Engineer Battalion,
(Triangular Division)



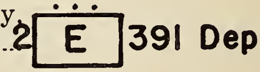
2d Platoon, 70th Engineers,
Light Ponton, Motorized,
GHQ Reserve



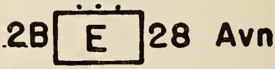
Bridge Company, 16th Engineer
Battalion, Armored



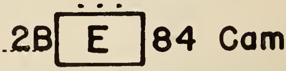
2d Platoon, 391st Engineer Company,
(Depot)



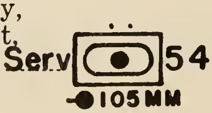
2d Platoon, Company B,
28th Engineers, (Aviation)



Factory Platoon, Shop Company,
84th Engineers, (Camouflage)

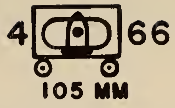


Gasoline Section, Service Battery,
54th Field Artillery Regiment,
(105mm Howitzer, Armored)

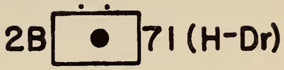


RD 2823-2

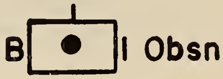
4th Section, Ammunition Train, 66th Field Artillery Regiment, (105mm Howitzer, Armored)



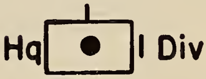
2d Section, Battery B, 71st Field Artillery Battalion, Horse-drawn



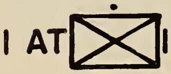
Battery B, 1st Field Artillery Observation Battalion



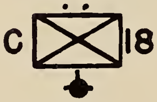
Headquarters Battery, 1st Division Artillery, (Triangular)



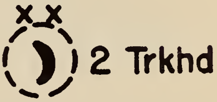
1st Antitank Squad, Antitank Company, 1st Infantry



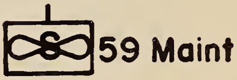
Mortar Section, Company C, 18th Infantry



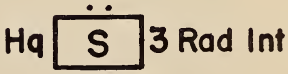
Truckhead, Class I Supply, 2d Division



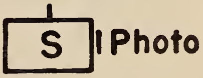
59th Signal Maintenance Company, Aviation



Intercept Section, Headquarters Platoon, 3d Radio Intelligence Company

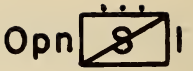


1st Signal Company, Photographic

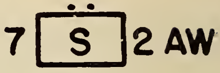


RD 2823-2

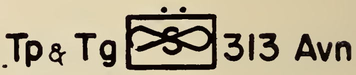
Operating Platoon, 1st Signal Troop,
1st Cavalry Division ....



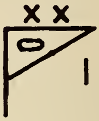
7th Aircraft Warning Section,
2d Aircraft Warning Company ......



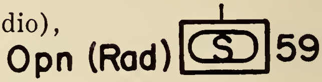
Telephone and Telegraph Section,
313th Signal Company, Aviation ....



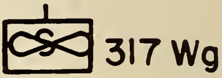
Point on Axis of
Signal Communications,
1st Armored Division ....



Signal Company, Operation, (radio),
59th Signal Battalion,
Armored Corps ....



317th Signal Company, Air Wing ....

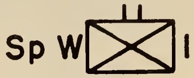


RD 2823-2

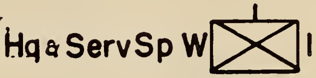
2. The following symbols, in addition to those in BFM 21-30, and those in Sec. 1, above, are prescribed for use in the Marine Corps Schools.

SPECIAL WEAPONS BATTALION

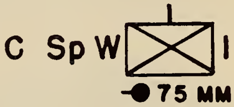
1st Special Weapons Battalion ....



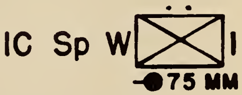
Headquarters & Service Battery,
1st Special Weapons Battalion



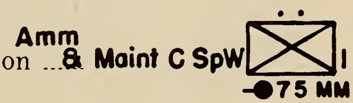
75mm Battery,
1st Special Weapons Battalion ......



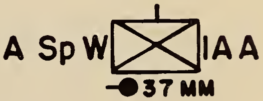
1st Gun Section, 75mm Battery,
1st Special Weapons Battalion ......



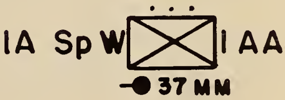
Ammunition and Maintenance
Section, 75mm Battery,
1st Special Weapons Battalion ...



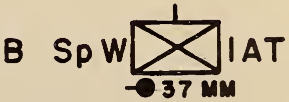
AA Battery 37mm,
1st Special Weapons Battalion ......



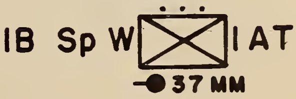
1st Platoon AA 37mm, AA Battery,
1st Special Weapons Battalion ......



AT Battery 37mm, 1st Special ......
Weapons Battalion



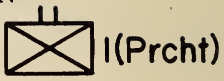
1st Platoon AT 37mm, AT Battery,
1st Special Weapons Battalion ......



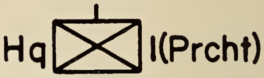
RD 2823-2

PARACHUTE BATTALION

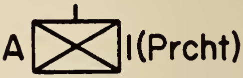
1st Parachute Battalion ....



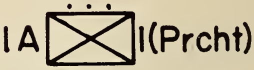
Headquarters Company,
1st Parachute Battalion ....



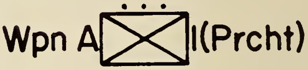
Company A(B)(C),
1st Parachute Battalion ....



1st (2d) (3d) Rifle Platoon,
Company A, 1st Parachute
Battalion ....

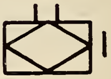


Weapons Platoon, Company A,
1st Parachute Battalion ....

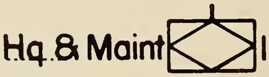


TANK BATTALION

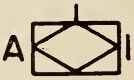
1st Tank Battalion ....



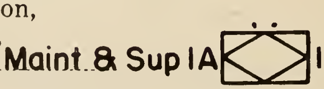
Headquarters & Maintenance
Company, 1st Tank Battalion



Company A, 1st Tank Battalion ....



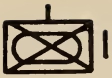
Maintenance & Supply Section,
1st Platoon, Company A,
1st Tank Battalion ....



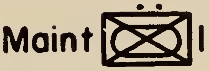
RD 28823-2

SCOUT COMPANY

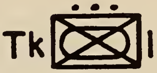
1st Scout Company ....



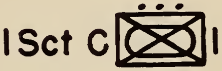
Maintenance Section,
1st Scout Company ....



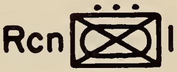
Tank Platoon, 1st Scout Company ....



1st Scout Car Platoon,
1st Scout Company ....

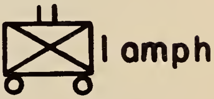


Reconnaissance Platoon,
1st Scout Company ....

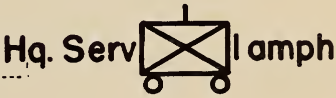


AMPHIBIAN TRACTOR BATTALION

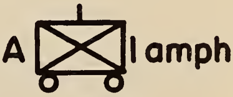
1st Amphibian Tractor Battalion ....



Headquarters & Service Company,
1st Amphibian Tractor Battalion....

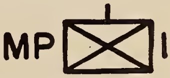


Company A,
1st Amphibian Tractor Battalion....



MILITARY POLICE COMPANY

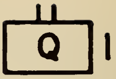
1st Military Police Company ....



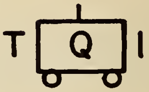
AD 2823-2

SERVICE BATTALION

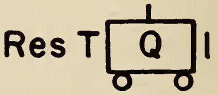
1st Service Battalion



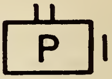
Transport Company,
1st Service Battalion



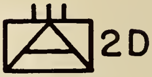
Reserve Transport Company,
1st Service Battalion



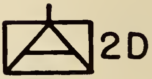
Pioneer Battalion,
1st Pioneer Battalion



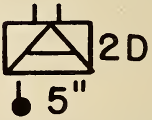
2d Defense Battalion



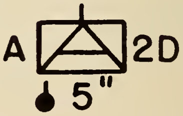
Headquarters & Service Battery,
2d Defense Battalion



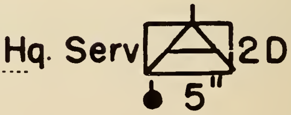
5″ Artillery Group,
2d Defense Battalion



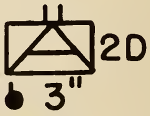
Battery A



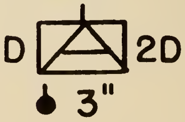
Headquarters & Service Battery,
5″ Artillery Group



AA Group, 2d Defense Battalion

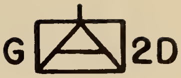


Battery D, AA Group

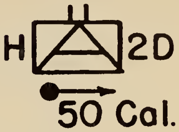


RD 2823-2

Searchlight & Sound Locator Battery Machine-Gun Group ....



.50 Cal. Machine-Gun Battery ....



RD2823-2

2. The following abbreviations have been added to the list shown in BFM 21-30, by a War Department change in that publication.

APO —Army Post Office
Bar Bln (Bn) —Barrage balloon (battalion)
BAR —Browning automatic rifle
Cir —Circular
Comd (car) —Command (car)
CPX —Command post exercise
Decon —Decontamination
Fi —Fighter
FS —Film strip
H-Dr —Horse drawn
H & Mecz —Horse and mechanized
How —Howitzer
Impreg —Impregnating
I —Intercepter
Mph —Miles per hour
MR —Mobilization Regulations
MTP —Mobilization Training Program
MTS —Motor Transport Service
Mtz —Motorized
OPLR —Outpost line of resistance
Prcht —Parachute
PW —Prisoners of war
Recp Cen —Reception center
Sct C Ht —Scout car, half track
Sem —Semimobile
Sc —Side car
SOI —Signal operations instructions
SOP —Sanding operating procedure
Tk Dtyr —Tank destroyer
TC —Training circular
TF —Training film
Trk Dr —Truck drawn
Trkhd —Truckhead
Wpn Carr —Weapon carrier
Wpn (Tr) (Plat) —Weapons (troop) (platoon)

TABLE 50

FIELD ENGINEERING DATA

1. **Intrenching Tools.**—a. The rifle squad is issued the following small size tools for fortification work:

1 cutters, wire, hand: squad leader.
1 axe intrenching: second in command.
3 pick mattocks: 3 privates.
7 shovels: 7 privates.

Whenever practicable, full size intrenching tools should be made available.

2. **Intrenchments.**—Estimated times to excavate various hasty intrenchments in medium soil using large size tools not under harassing fire.

One man foxhole	2 hours
Two man foxhole (two men digging)	2 hours
Heavy cal. .30 machine-gun emplacement, open shallow type (two men digging)	1½ hours
Heavy cal. .30 machine-gun emplacement, open standing type (two men digging)	4½ hours
Heavy cal. .30 machine-gun emplacement, three foxhole type (three men digging)	2 hours
Light cal. .30 machine-gun emplacement, shallow type (two men digging)	½ hour
Light cal. .30 machine-gun emplacement, open standing type (two men digging)	2½ hours
Light cal. .30 machine-gun emplacement, three foxhole type (three men digging)	2 hours
37mm antitank gun emplacement, shell hole type (four men digging)	1 hour
37mm antitank gun emplacement, ramp types (three men digging)	2 hours
60mm mortar emplacement (two men digging)	2 hours
81mm mortar emplacement (two men digging)	5 hours

3. **Obstacles.**—Estimated times for erecting standard types of barbed wire entanglements using adequately supplied and properly organized wiring parties in daylight, not under harassing fire.

a. Double apron fence: Standard for tactical obstacle. 100 yards per hour.

b. 4 strand fence: Used as protective obstacle. 200 yards per hour.

c. For wiring at night increase time required by 50 percent.

TABLE 51

FOREIGN MAPS

The British Grid System is usually found on European maps. In this system, the area is divided into large squares 500 km. on each side. Each of these squares is designated by a letter of the alphabet. The large squares are divided into twenty-five smaller squares 100 km. on each side and these smaller squares are also designated by letters of the alphabet from A to Z excluding "I". The origin of coordinates is the southwest corner of the smaller lettered square. Numbered coordinates are measured to the right (East) and up (North) from this origin. The coordinates of a point in large square "V", small square "T", 4.5 grid lines east and 5.6 grid lines north of the southwest corner of the square "T" would be written (v) T4556. On smaller scale maps greater accuracy may be obtained by further interpolation between grid lines. The coordinates of the above point may be written (v) T453562. The first half of the digits, 453, are measured to the right (East) and the latter half, 562, are measured up (North) from the southwest corner of square "T".

The origin of longitude is generally Greenwich but occasionally Paris, Ferro Island, or some other city is used. In some cases longitude and latitude are expressed in grads rather than degrees.

Distance is measured in meters and kilometers. If necessary to convert to yards or miles the following conversion factors may be used:

METRIC CONVERSION FACTORS

Unit	Exact equivalent	Convenient approximation	Conversion formulae
1 milimeter 1 meter	.0393 in. 1.0936 yds. 3.281 ft.	1/25 or .04 in. 1.1 yds. 3-⅓ or 3.3 ft.	mm × .04 = ins. m × 1.1 = yds. m × 3.3 = ft.
1 kilometer (1000 meters)	1093.61 yds. .62137 mile	1100 yds. ⅝ mile	km × 1100 = yds. km × ⅝ = miles
1 grad	.9 degree	.9 degree	grad × .9 = degrees
1 yard	.9144 meters	.9 meters	yds. × .9 = meters
1 mile	1609.35 meters 1.609 kilometers	1600 meters 1-3/5 or 1.6 kilometers	mi. × 1600 = meters mi. × 8/5 = kilometers
1 degree	$\frac{10}{9}$ grad	1.1 grad	Degrees × 1.1 = grads

TRANSLATION OF ENGLISH GEOGRAPHICAL TERMS

English	German	Norwegian	French
City, town	Stadt	stad, by	ville
Village	Dorf	landsby	village
Fortress, fort	Festung, Fort	faestning	forteresse, fort
House	Haus	huus	maison
Bridge	Brucke	bro	pont
Coast, shore	Kuste	kyst	cote
Island	Insel	o	ile
Plain, field	Feld	slette, mark	plaine, champ
Desert	Wuste	ork	desert
Heath	Steppe	steppe	lande, prairie
Fen, marsh, swamp	Sumpf	sump	marais
Forest, wood	Wald	skov	foret
Plateau	Plateau	hoislette, fjeld	plateau
Mountains	Gebirge	bjergkjaede	montagne
Mount	Berg	bjerg	mont
North	Nord	nord	nord
South	Süd	syd	sud
East	Ost	ost	est
West	West	vest	ouest
Water	Wasser	vand	eau
Spring, well	Quelle, Brunnen	kilde	source, puits
River	Fluss, Strom	flod	fleuve, riviére
Lake	See	so	lac
Sea	Meer, See	hav	mer
Port, harbor	Hafen	havn	port
Great, big, large	gross	stor	grand
Little, small	klein	ille	petit
Long	lang	lang	long
High	hoch	hoi	haut
Upper	ober	ovre	haut, superieur
Lower	unter	nedre	bas, inferieur
Old	alt	gammel	vieux
New	neu	ny	neuf
Saint	Heilige	hellig	saint

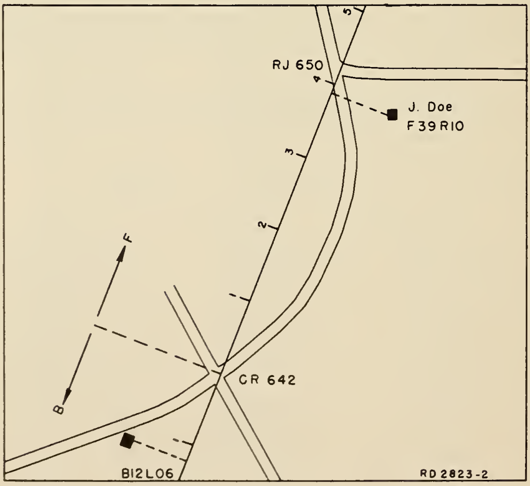
TABLE 52

USE OF THRUST LINE

There is an increasing use of the "Thrust Line" system of location. It may be used on ungridded maps or photographs. It is easy to understand and yet furnishes a secret means of transmitting information regarding the location of troops and installations. The Thrust Line may be changed periodically and thus further confuse the enemy.

In this system a Thrust Line is designated by naming two points on the map and drawing a straight line thru them. This line may be extended indefinitely in either direction. It is usually drawn in the direction of attack. To determine the Thrust Line coordinates of a point on the map, draw a line thru the point perpendicular to the Thrust Line. Measure the distance from the origin (first point named in designating the Thrust Line) to the intersection of these lines and from the intersection to the point in question. The letter F (Forward) or B (Back) precedes the numbers which indicate the distance measured along the Thrust Line and the letter R (Right) or L (Left) precedes the numbers that indicate the distance measured from the Thrust Line right or left to the point in question.

Example: Thrust Line: CR 642 - RJ 650



Distance may be measured in inches and tenths of inches provided all units have maps of the same scale. If distances are indicated as ground distances in yards or miles, the scale of the map does not affect the Thrust Line figures.

In the example above it will be noted that F39 means forward 3 and 9 tenths miles along the Thrust Line and R10 means 1 and 0 tenths miles to the right of the Thrust Line. Although the decimal point is not written it must be inferred and the last digit of each set of numbers represents tenths of a mile.

The house at B12L06 is found by measuring 1.2 miles back from CR 642 and Left (as you face the enemy) 0.6 miles.

BIBLIOGRAPHY

Staff Officer's Field Manual, Organization, Technical, and Logistical Data, FM 101-10.

Chemical Warfare Service FM, Vol. 1, 1938.

Reference Data, MCS, 1942.

Instructional Notes MCS Logistics, Tentative Text, 1940-1941.

12328 MCS QUANTICO, VA. 6-16-43--500

MARINE CORPS HISTORICAL LIBRARY

Reference data. 13303

#268798465

Library of the Marine Corps
3000193939